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VOL. XII. MIE——NEG

INDOCTI DISCANT, ET AMENT MEMINISSE PERITI.

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ENCYCLOPÆDIA.

MIEL (Jan), called *Giovanni della Vite*, a moſt eminent painter, was born in Flanders in 1599. He was at firſt a diſciple of Gerard Seghers, in whoſe ſchool he made a diſtinguiſhed figure; but he quitted that artiſt, and went to Italy, to improve himſelf in deſign, and to obtain a more extenſive knowledge of the ſeveral branches of his art. At Rome he particularly ſtudied and copied the works of the Caracci and Corregio; and was admitted into the academy of Andrea Sacchi, where he gave ſuch evident proofs of extraordinary merit and genius, that he was invited by Andrea to aſſiſt him in a grand deſign which he had already begun. But Miel, through ſome diſguſt, rejected theſe elevated ſubjects which at firſt had engaged his attention, refuſed the friendly propoſal of Sacchi, and choſe to imitate the ſtyle of Bamboccio, as having more of that nature which pleaſed his own imagination. His general ſubjects were huntings, carnivals, gypſies, beggars, paſtoral ſcenes, and converſations; of thoſe he compoſed his eaſel-pictures, which are the fineſt of his performances. But he alſo painted hiſtory in a large ſize in freſco, and in oil; which, though they ſeem to want elevation of deſign, and a greater degree of grace in the heads, yet appear ſuperior to what might be expected from a painter of ſuch low ſubjects as he generally was fond of repreſenting. His pictures of huntings are particularly admired: the figures and animals of every ſpecies being deſigned with uncommon ſpirit, nature, and truth. The tranſparence of his colouring, and the clear tints of his ſkies, enliven his compoſitions; nor are his paintings in any degree inferior to thoſe of Bamboccio either in their force or luſtre. His large works are not ſo much to be commended for the goodneſs of the deſign as for the expreſſion and colouring; but it is in his ſmall pieces that the pencil of Miel appears in its greateſt delicacy and beauty. The ſingular merit of this maſter recommended him to the favour of Charles Emanuel duke of Savoy, who invited him to his court, where he appointed Miel his principal painter, and afterwards honoured him with the order of St Mauritius, and made him a preſent of a croſs ſet with diamonds of a great value, as a particular mark of his eſteem. He died in 1664.

MIERIS (Francis), the *Old*, a juſtly celebrated painter, was born at Leyden in 1635; and was at firſt placed under the direction of Abraham Toorne Vliet, one of the beſt deſigners of the Low Countries, and afterwards entered himſelf as a diſciple with Gerard Douw. In a ſhort time he far ſurpaſſed all his companions, and was by his maſter called the prince of his diſciples. His manner of painting ſilks, velvets, ſtuffs, or carpets, was ſo ſingular, that the different kinds and fabric of any of them might eaſily be diſtinguiſhed. His pictures are rarely to be ſeen, and as rarely to be ſold; and when they are, the purchaſe is extremely high, their intrinſic value being ſo inconteſtably great. Beſide portraits, his general ſubjects were converſations, perſons performing on muſical inſtruments, patients attended by the apothecary or doctor, chymiſts at work, mercers ſhops, and ſuch like; and the uſual valuation he ſet on his pictures was eſtimated at the rate of a ducat an hour. The fineſt portrait of this maſter's hand is that which he painted for the wife of Cornelius Plaats, which is ſaid to be ſtill preſerved in the family, although very great ſums have been offered for it. In the poſſeſſion of the ſame gentleman was another picture of Mieris, repreſenting a lady fainting, and a phyſician applying the remedies to relieve her. For that performance he was paid (at his uſual rate of a ducat an hour) ſo much money as amounted to fifteen hundred florins when the picture was finiſhed. The grand duke of Tuſcany wiſhed to purchaſe it, and offered three thouſand florins for it, but the offer was not accepted. However, that prince procured ſeveral of his pictures, and they are at this day an ornament to the Florentine collection. One of the muſt curious of them is a girl holding a candle in her hand, and it is accounted ineſtimable. This painter died in 1681.

MIERIS (John), ſon of the former, was born at Leyden in 1660, and learned the art of painting from his father. The young artiſt unhappily was ſeverely afflicted with the gravel and ſtone; and by thoſe complaints was much hindered in the progreſs of his ſtudies. But, after the death of his father, he travelled to Germany, and from thence to Florence, where the fame of his father's merit procured him a moſt honourable reception from the grand duke, who, when he ſaw ſome of his paintings, endeavoured to retain him in his ſervice. But Mieris politely declined it, and proceeded to Rome, where his great abilities were well known before his arrival, and his works were exceedingly coveted. In that city his malady increaſed; yet at the intervals of eaſe he continued to work with his uſual application, till the violence of his diſtemper ended his days in 1690, when he was only thirty years old. He was allowed to have been as eminent for painting in a large ſize as his father had been for his works in ſmall.

MIERIS (William), called the *Young Mieris*, was brother to the former, and born at Leyden in 1662. During the life of his father, he made a remarkable progreſs: but, by being deprived of his director when he was only arrived at the age of nineteen, he had recourſe to nature, as the moſt inſtructive guide; and by ſtudying with diligence and judgement to imitate her, he approached near to the merit of his father. At

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firſt he took his ſubjects from private life, in the manner of Francis; ſuch as tradeſmen in their ſhops, or a peaſant ſelling vegetables and fruit, and ſometimes a woman looking out at a window; all which he copied minutely after nature, nor did he paint a ſingle object without his model. As Mieris had obſerved the compoſitions of Gerrard Laireſſe, and other great hiſtorical painters, with ſingular delight, he attempted to deſign ſubjects in that ſtyle; and began with the ſtory of Rinaldo ſleeping on the lap of Armida, ſurrounded with the loves and graces, the fore-ground being enriched with plants and flowers; a work which added greatly to his fame, and was ſold for a very high price. This maſter alſo painted landſcapes and animals with equal truth and neatneſs; and modelled in clay and wax, in ſo ſharp and accurate a manner, that he might juſtly be ranked among the moſt eminent ſculptors. In the delicate finiſhing of his works, he imitated his father; as he likewiſe did in the luſtre, harmony, and truth, of his paintings, which makes them to be almoſt as highly prized; but they are not equal in reſpect of deſign, or of the ſtriking effect, nor is his touch ſo very exquiſite as that of the father. The works of the old Mieris are better compoſed, the figures are better grouped, and they have leſs confuſion; yet the younger Mieris is acknowledged to be an artiſt of extraordinary merit, although inferior to him, who had ſcarcely his equal. He died in 1747.

Mieris (Francis), called the *Young Francis*, was the Son of William, and the grandſon of the celebrated Francis Mieris; and was born at Leyden in 1689. He learned the art of painting from his father, whoſe manner and ſtyle he always imitated; he choſe the ſame ſubjects, and endeavoured to reſemble him in his colouring and pencil. But with all his induſtry he proved far inferior to him: and moſt of thoſe pictures which at the public ſales are ſaid to be of the young Mieris, and many alſo in private collections aſcribed to the elder Francis, or William, are perhaps originally painted by this maſter, who was far inferior to both; or are only his copies after the works of thoſe excellent painters, as he ſpent abundance of his time in copying their performances.

MIEZA, (anc. geog.), a town of Macedonia which was anciently called *Strymonium*, ſituated near Stagira. Here, Plutarch informs us, the ſtone ſeats and ſhady walks of Ariſtotle were ſhown. Of this place was Peuceſtes, one of Alexander's generals, and therefore ſurnamed *Miezæus*, (Arrian.)

MIGDOL, or Magdol, (anc. geog.), a place in the Lower Egypt, on this ſide Pihahiroth, or between it and the Red Sea, towards its extremity. The term denotes a tower or fortreſs. It is probably the *Magdolum* of Herodotus, ſeeing the Septuagint render it by the ſame name.

MIGNARD (Nicholas), a very ingenious French painter, born at Troyes in 1628; but, ſettling at Avignon, is generally diſtinguiſhed from his brother Peter by the appellation of *Mignard of Avignon*.. He was afterwards employed at court and at Paris, where he became rector of the royal academy of painting. There are a great number of his hiſtorical pieces and portraits in the palace of the Thuilleries. He died in 1690.

Mignard (Peter), the brother of Nicholas, was born at Troyes in 1610; and acquired ſo much of the taſte of the Italian ſchool, as to be known by the name of the *Roman*. He was generally allowed to have a ſuperior genius to his brother Nicholas; and had the honour of painting the popes Alexander VII. and Urban VIII. beſides many of the nobility at Rome, and ſeveral of the Italian princes: His patron, Louis, ſat ten times to him for his portrait, and reſpected his talents ſo much as to ennoble him, make him his principal painter after the death of Le Brun, and appoint him director of the manufactories. He died in 1695, and many of his pieces are to be ſeen at St Cloud.

MIGNON, or Minjon, (Abraham), a celebrated painter of flowers and ſtill life, was born at Frankfort in 1639; and his father having been deprived of the greateſt part of his ſubſtance by a ſeries of loſſes in trade, left him in very neceſſitous circumſtances when he was only ſeven years of age. From that melancholy ſituation he was reſcued by the friendſhip of James Murel, a flower-painter in that city; who took Mignon into his own houſe, and inſtructed him in the art, till he was 17 years old. Murel had often obſerved an uncommon genius in Mignon: he therefore took him along with him to Holland, where he placed him as a diſciple with David de Heem; and while he was under the direction of that maſter he laboured with inceſſant application to imitate the manner of De Heem, and ever afterwards adhered to it; only adding daily to his improvement, by ſtudying nature with a moſt exact and curious obſervation.—"When we conſider the paintings of Mignon, one is at a loſs (Mr Pilkington obſerves) whether moſt to admire the freſhneſs and beauty of his colouring, the truth in every part, the bloom on his objects, or the perfect reſemblance of nature viſible in all his performances. He always ſhows a beautiful choice in thoſe flowers and fruits from which his ſubjects are compoſed: and he groups them with uncommon elegance. His touch is exquiſitely neat, though apparently eaſy and unlaboured; and he was fond of introducing inſects among the fruits and flowers, wonderfully finiſhed, ſo that even the drops of dew appear as round and as tranſlucent as nature itſelf." He had the good fortune to be highly paid for his works in his lifetime; and he certainly would have been accounted the beſt in his profeſſion even to this day, if John Van Huyſum had not appeared. Weyerman, who had ſeen many admired pictures of Mignon, mentions one of a moſt capital kind. The ſubject of it is a cat, which had thrown down a pot of flowers, and they lie ſcattered on a marble table. That picture is in every reſpect ſo wonderfully natural, that the ſpectator can ſcarce perſuade himſelf that the water which is ſpilled from the veſſel is not really running down from the marble. This picture is diſtinguiſhed by the title of *Mignon's Cat*. This painter died in 1679, aged only 40.

MIGRATION, the paſſage or removal of a thing out of one place into another.

Migration *of Birds*.—It has been generally believed, that many different kinds of birds annually paſs from one country to another, and ſpend the ſummer or the winter where it is moſt agreeable to them; and that even the birds of Britain will ſeek the moſt diſtant ſouthern regions of Africa, when directed by a peculiar inſtinct to leave their own country. It has long been an opinion pretty generally received, that ſwallows reſide during the winter-ſeaſon in the warm ſouthern regions; and Mr Adanſon particularly relates his having ſeen them at Senegal when they were obliged to leave this country. But beſides the ſwallow, Mr Pennant enumerates many other birds which migrate from Britain at different times of the year, and are then to be found in other countries; after which they again leave theſe countries, and return to Britain. The reaſon of theſe migrations he ſuppoſes to be a defect of food at certain ſeaſons of the year, or the want of a ſecure aſylum from the perſecution of man during the time of courtſhip, incubation, and nutrition. The following is his liſt of the migrating ſpecies.

1. *Crows.* Of this genus, the hooded crow migrates regularly with the woodcock. It inhabits North Britain the whole year: a few are ſaid annually to breed on Dartmoor, in Devonſhire. It breeds alſo in Sweden and Auſtria: in ſome of the Swediſh provinces it only ſhifts its quarters, in others it reſides throughout the year. Our author is at a loſs for the ſummer retreat of thoſe which viſit us in ſuch numbers in winter, and quit our country in the ſpring; and for the reaſon why a bird, whoſe food is ſuch that it may be found at all ſeaſons in this country, ſhould leave us.

2. *Cuckoo.* Diſappears early in autumn; the retreat of this and the following bird is quite unknown to us.

3. *Wryneck.* Is a bird that leaves us in the winter. If its diet be ants alone, as ſeveral aſſert, the cauſe of its migration is very evident. This bird diſappears before winter, and reviſits us in the ſpring a little earlier than the cuckoo.

4. *Hoopoe.* Comes to England but by accident: Mr Pennant once indeed heard of a pair that attempted to make their neſt in a meadow at Selborne, Hampſhire, but were frightened away by the curioſity of people. It breeds in Germany.

5. *Grous.* The whole tribe, except the quail, lives here all the year round: that bird either leaves us, or elſe retires towards the ſea-coaſts.

6. *Pigeons.* Some few of the ring-doves breed here; but the multitude that appears in the winter is ſo diſproportioned to what continue here the whole year, as to make it certain that the greateſt part quit the country in the ſpring. It is moſt probable they go to Sweden to breed, and return from thence in autumn; as Mr Ekmark informs us they entirely quit that country before winter. Multitudes of the common wild pigeons alſo make the northern retreat, and viſit us in winter; not but numbers breed in the high cliffs in all parts of this iſland. The turtle alſo probably leaves us in the winter, at leaſt changes its place, removing to the ſouthern counties.

7. *Stare.* Breeds here. Poſſibly ſeveral remove to other countries for that purpoſe, ſince the produce of thoſe that continue here ſeems unequal to the clouds of them that appear in winter. It is not unlikely that many migrate into Sweden, where Mr Berger obſerves they return in ſpring.

8. *Thruſhes.* The fieldfare and the redwing breed and paſs their ſummers in Norway and other cold countries; their food is berries, which abounding in our kingdoms, tempt them here in the winter. Theſe two and the Royſton crow are the only land-birds that regularly and conſtantly migrate into England, and do not breed here. The hawfinch and croſsbill come here at ſuch uncertain times as not to deſerve the name of birds of paſſage.

9. *Chatterer.* The chatterer appears annually about Edinburgh in flocks during winter; and feeds on the berries of the mountain-aſh. In South Britain it is an accidental viſitant.

10. *Groſbeaks.* The groſbeak and croſsbill come here but ſeldom; they breed in Auſtria. The pine groſbeak probably breeds in the foreſts of the Highlands of Scotland.

11. *Buntings.* All the genus inhabits England throughout the year; except the greater brambling, which is forced here from the north in very ſevere ſeaſons.

12. *Finches.* All continue in ſome parts of theſe kingdoms, except the ſiſkin, which is an irregular viſitant, ſaid to come from Ruſſia. The linnets ſhift their quarters, breeding in one part of this iſland, and remove with their young to others. All finches feed on the ſeeds of plants.

13. *Larks, fly-catchers, wagtails, and warblers.* All of theſe feed on inſects and worms; yet only part of them quit theſe kingdoms; though the reaſon of migration is the ſame to all. The nightingale, black-cap, fly-catcher, willow-wren, wheat-ear, and white-throat, leave us before winter, while the ſmall and delicate golden-creſted wren braves our ſevereſt froſts. The migrants of this genus continue longeſt in Great Britain in the ſouthern counties, the winter in thoſe parts being later than in thoſe of the north; Mr Stillingfleet having obſerved ſeveral wheat-ears in the iſle of Purbeck on the 18th of November. As theſe birds are incapable of very diſtant flights, Spain, or the ſouth of France, is probably their winter-aſylum.

14. *Swallows and goat-ſucker.* Every ſpecies diſappears at the approach of winter.

WATER-FOWL.

Of the vaſt variety of water-fowl that frequent Great Britain, it is amazing to reflect how few are known to breed here: the cauſe that principally urges them to leave this country, ſeems to be not merely the want of food, but the deſire of a ſecure retreat. Our country is too populous for birds ſo ſhy and timid as the bulk of theſe are: when great part of our iſland was a mere waſte, a tract of woods and fen, doubtleſs many ſpecies of birds (which at this time migrate) remained in ſecurity throughout the year.—Egrets, a ſpecies of heron now ſcarce known in this iſland, were in former times in prodigious plenty; and the crane, that has totally forſaken this country, bred familiarly in our marſhes: their place of incubation, as well as of all other cloven-footed water-fowl (the heron excepted), being on the ground, and expoſed to every one. As rural economy increaſed in this country, theſe animals were more and more diſturbed; at length, by a ſeries of alarms, they were neceſſitated to ſeek, during the ſummer, ſome lonely ſafe habitation.

On the contrary, thoſe that build or lay in the almoſt inacceſſible rocks that impend over the Britiſh ſeas, breed there ſtill in vaſt numbers, having little to fear from the approach of mankind: the only diſturbance they meet with in general being from the deſperate attempts of ſome few to get their eggs.

CLOVEN-FOOTED WATER-FOWL.

15. *Herons.* The white heron is an uncommon bird, and viſits us at uncertain ſeaſons; the common kind and the bittern never leave us.

16. *Curlews.* The curlew breeds ſometimes on our mountains; but, conſidering the vaſt flights that appear in winter, it is probable that the greater part retire to other countries: the whimbrel breeds on the Grampian hills, in the neighbourhood of Invercauld.

17. *Snipes.* The woodcock breeds in the moiſt woods of Sweden, and other cold countries. Some ſnipes breed here, but the greateſt part retire elſewhere; as do every other ſpecies of this genus.

18. *Sandpipers.* The lapwing continues here the whole year; the ruff breeds here, but retires in winter; the redſhank and ſandpiper breed in this country, and reſide here. All the others abſent themſelves during ſummer.

19. *Plovers and oyſter-catcher.* The long-legged plover and ſanderling viſit us only in winter; the dottrel appears in ſpring and in autumn; yet, what is very ſingular, we do not find it breeds in ſouth Britain. The oyſter-catcher lives with us the whole year. The Norfolk plover and ſea-lark breed in England. The green plover breeds on the mountains of the north of England, and on the Grampian hills.

We muſt here remark, that every ſpecies of the genera of curlews, woodcocks, ſandpipers, and plovers, that forſake us in the ſpring, retire to Sweden, Poland, Pruſſia, Norway, and Lapland, to breed: as ſoon as the young can fly, they return to us again, becauſe the froſts which ſet in early in thoſe countries totally deprive them of the means of ſubſiſting; as the dryneſs and hardneſs of the ground, in general, during our ſummer, prevent them from penetrating the earth with their bills, in ſearch of worms, which are the natural food of theſe birds. Mr Ekmark ſpeaks thus of the retreat of the whole tribe of cloven-footed water fowl out of his country (Sweden) at the approach of winter; and Mr Klein gives much the ſame account of thoſe of Poland and Pruſſia.

20. *Rails and gallinules.* Every ſpecies of theſe two genera continue with us the whole year; the land-rail excepted, which is not ſeen here in winter. It likewiſe continues in Ireland only during the ſummer months, when they are very numerous, as Mr Smith tells us in the *Hiſtory of Waterford*, p. 336. Great numbers appear in Angleſea the latter end of May; it is ſuppoſed that they paſs over from Ireland, the paſſage between the two iſlands being but ſmall. As we have inſtances of theſe birds lighting on ſhips in the channel and the Bay of Biſcay, we may conjecture their winter quarters to be in Spain.

FINNED-FOOTED WATER-BIRDS.

21. *Phalaropes.* Viſit us but ſeldom; their breeding place is Lapland, and other arctic regions.

22. *Grebes.* The great-creſted grebe, the black and white grebe, and little grebe, breed with us, and never migrate; the others viſit us accidentally, and breed in Lapland.

WEB-FOOTED BIRDS.

23. *Avoſet.* Breed near Foſsdike in Lincolnſhire; but quit their quarters in winter. They are then ſhot in different parts of the kingdom, which they viſit, not regularly, but accidentally.

24. *Auks and guillemots.* The great auk or pinguin ſometimes breeds in St Kilda. The auk, the guillemot, and puffin, inhabit moſt of the maritime cliffs of Great Britain, in amazing numbers, during ſummer. The black guillemot breeds in the Baſs Iſle, and in St Kilda, and ſometimes in Llandidno rocks. We are at a loſs for the breeding place of the other ſpecies; neither can we be very certain of the winter reſidence of any of them, excepting of the leſſer guillemot and black-billed auk, which, during winter, viſit in vaſt flocks the Frith of Forth.

25. *Divers.* Theſe chiefly breed in the lakes of Sweden and Lapland, and in ſome countries near the pole; but ſome of the red-throated divers, the northern and the imber, may breed in the north of Scotland and its iſles.

26. *Terns.* Every ſpecies breeds here; but leaves us in the winter.

27. *Petrels.* The fulmar breeds in the Iſle of St Kilda, and continues there the whole year except September and part of October: the ſhearwater viſits the Iſle of Man in April; breeds there; and, leaving it in Auguſt or the beginning of September, diſperſes over all parts of the Atlantic ocean. The ſtormfinch is ſeen at all diſtances from land on the ſame vaſt watery tract; nor is ever found near the ſhore except by ſome very rare accident, unleſs in the breeding ſeaſon. Mr Pennant found it on ſome little rocky iſles, off the north of Skie. It alſo breeds in St Kilda. He alſo ſuſpects that it neſtles on the Blaſquet Iſles off Kerry, and that it is the gourder of Mr Smith.

28. *Merganſers.* This whole genus is mentioned among the birds that fill the Lapland lakes during ſummer. Mr Pennant has ſeen the young of the redbreaſted in the north of Scotland: a few of theſe, and perhaps of the gooſanders, may breed there.

29. *Ducks.* Of the numerous ſpecies that form this genus, we know of few that breed here: The ſwan and gooſe, the ſhield-duck, the eider duck, a few ſhovelers, garganies, and teals, and a very ſmall portion of the wild ducks.

The reſt contribute to form that amazing multitude of water-fowl that annually repair from moſt parts of Europe to the woods and lakes of Lapland and other arctic regions, there to perform the functions of incubation and nutrition in full ſecurity. They and their young quit their retreat in September, and diſperſe themſelves over Europe. With us they make their appearance the beginning of October; circulate firſt round our ſhores; and, when compelled by ſevere froſt, betake themſelves to our lakes and rivers. Of the web-footed fowl there are ſome of hardier conſtitutions than others: theſe endure the ordinary winters of the more northern countries; but when the cold reigns there with more than common rigour, they repair for ſhelter to theſe kingdoms: this regulates the appearance of ſome of the diver kind, as alſo of the wild ſwans, the ſwallow-tailed ſhield-duck, and the different ſorts of gooſanders which then viſit our coaſts. Barentz found the barnacles with their neſts in great numbers in Nova Zembla. (*Collect. Voy. Dutch Eaſt-India Company*, 8vo. 1703, p. 19.) Cluſius, in his *Exot.* 368.

alſo obſerves, that the Dutch diſcovered them on the rocks of that country and in Waygate Straits. They, as well as the other ſpecies of wild-geeſe, go very far north to breed, as appears from the hiſtories of Greenland and Spitzbergen, by Egede and Crautz. Theſe birds ſeem to make Iceland a reſting place, as Horrebow obſerves: few continue there to breed, but only viſit that iſland in the ſpring, and after a ſhort ſtay retire ſtill farther north.

30. *Corvorants.* The corvorant and ſhag breed on moſt of our high rocks: the gannet in ſome of the Scotch iſles, and on the coaſt of Kerry: the two firſt continue on our ſhores the whole year. The gannet diſperſes itſelf all round the ſeas of Great Britain, in purſuit of the herring and pilchard, and even as far as the Tagus to prey on the ſardina.

But of the numerous ſpecies of fowl here enumerated, it may be obſerved how very few intruſt themſelves to us in the breeding ſeaſon, and what a diſtant flight they make to perform the firſt great dictate of nature.

There ſeems to be ſcarcely any but what we have traced to Lapland, a country of lakes, rivers, ſwamps, and alps, covered with thick and gloomy foreſts, that afford ſhelter during ſummer to theſe fowls, which in winter diſperſe over the greateſt part of Europe. In thoſe arctic regions, by reaſon of the thickneſs of the woods, the ground remains moiſt and penetrable to the woodcocks, and other ſlender-billed fowl: and for the web-footed birds the waters afford larvæ innumerable of the tormenting knat. The days there are long; and the beautiful meteorous nights indulge them with every opportunity of collecting ſo minute a food: whilſt mankind is very ſparingly ſcattered over that vaſt northern waſte.

Why then ſhould Linnæus, the great explorer of theſe rude deſarts, be amazed at the myriads of water-fowl that migrated with him out of Lapland? which exceeded in multitude the army of Xerxes; covering, for eight whole days and nights, the ſurface of the river Calix! His partial obſervation as a botaniſt, would confine their food to the vegetable kingdom, almoſt denied to the Lapland waters; inattentive to a more plenteous table of inſect food, which the all-bountiful Creator had ſpread for them in the wilderneſs. It may be remarked, that the lakes of mountainous rocky countries in general are deſtitute of plants: few or none are ſeen on thoſe of Switzerland; and Linnæus makes the ſame obſervation in reſpect to thoſe of Lapland; having, during his whole tour, diſcovered only a ſingle ſpecimen of a *lemma triſulca*, or "ivy-leaved duck's meat," *Flora Lap.* n° 470.; a few of the *ſcirpus lacuſtris*, or "ballruſh," n° 18.; the *alopecurus geniculatus*, or "flote foxtail graſs," n° 38.; and the *ranunculus aquatilis*, n° 234.; which are all he enumerates in his *Prolegomena* to that excellent performance.

Under the article SWALLOW will be found the principal arguments for and againſt the migration of ſwallows. Here we ſhall give a ſhort abſtract of the arguments uſed by the Hon. Daines Barrington againſt the migration of birds in general, from a paper publiſhed by him in the 62d volume of the Philoſophical Tranſactions. This gentleman denies that any well-atteſted inſtances can be produced of this ſuppoſed migration; which, he thinks, if there were any ſuch periodical flight, could not poſſibly have eſcaped the frequent obſervation of ſeamen. It has indeed been aſſerted that birds of paſſage become inviſible in their flight, becauſe they riſe too high in the air to be perceived, and becauſe they chooſe the night for their paſſage. The author, however, expreſſes his doubts "whether any bird was ever ſeen to riſe to a greater height than perhaps twice that of St Paul's croſs;" and he further endeavours to ſhow, that the extent of ſome of theſe ſuppoſed migrations (from the northern parts of Europe, for inſtance, to the line) is too great to be accounted for, by having recourſe to the argument founded on a nocturnal paſſage.

The author next recites, in a chronological order, all the inſtances that he has been able to collect, of birds having been actually ſeen by mariners when they were croſſing a large extent of ſea; and he endeavours to ſhow that no ſtreſs can be laid on the few caſual obſervations of this kind that have been produced in ſupport of the doctrine of a regular and periodical migration.

Mr Barrington afterwards proceeds to invalidate M. Adanſon's celebrated obſervation with reſpect to the migration of the ſwallow in particular, and which has been conſidered by many as perfectly deciſive of the preſent queſtion. He endeavours to ſhow that the four ſwallows which that naturaliſt caught, on their ſettling upon his ſhip, on the 6th of October at about the diſtance of 50 leagues from the coaſt of Senegal, and which he ſuppoſes to have been then proceeding from Europe to paſs the winter in Africa, could not be true European ſwallows; or, if they were, could not have been on their return from Europe to Africa. His objections are founded principally on ſome proofs which he produces of M. Adanſon's want of accuracy on this ſubject, which has led him in the preſent inſtance, to miſtake two African ſpecies of the ſwallow-tribe, deſcribed and engraved by Briſſon, for European ſwallows, to which they bear a general reſemblance; or granting even that they were European ſwallows, he contends, that they were flitting from the Cape de Verd Iſlands to the coaſt of Africa; "to which ſhort flight, however, they were unequal, and accordingly fell into the ſailor's hands." See the article SWALLOW.—We ſhall here only add, in oppoſition to the remarks of Mr Barrington, the following obſervations of the Rev. Mr White * in a letter to Mr Pennant on this ſubject.

"We muſt not (ſays he) deny migration in general; becauſe migration certainly does ſubſiſt in ſome places, as my brother in Andaluſia has fully informed me. Of the motions of theſe birds he has ocular demonſtration, for many weeks together, both ſpring and fall: during which periods myriads of the ſwallow kind traverſe the Straits from north to ſouth, and from ſouth to north, according to the ſeaſon. And theſe vaſt migrations conſiſt not only of hirundines, but of bee-birds, hoopoes, oro pendolos, or golden thruſhes, &c. &c. and alſo of many of our ſoft-billed ſummer birds of paſſage; and moreover of birds which never leave us, ſuch as all the various ſorts of hawks and kites. Old Belon, 200 years ago, gives a curious account of the incredible armies of hawks and kites which he ſaw in the ſpring-time traverſing the Thra-

* Natural Hiſtory of Selborne, Letter ix. p. 139.

Migration

St Miguel.

cian Boſphorus from Aſia to Europe. Beſides the abovementioned, he remarks, that the proceſſion is ſwelled by whole troops of eagles and vultures.

"Now it is no wonder that birds reſiding in Africa ſhould retreat before the ſun as it advances, and retire to milder regions, and eſpecially birds of prey, whoſe blood being heated with hot animal food, are more impatient of a ſultry climate: but then I cannot help wondering why kites and hawks, and ſuch hardy birds as are known to defy all the ſeverity of England, and even of Sweden and all north Europe, ſhould want to migrate from the ſouth of Europe, and be diſſatisfied with the winters of Andaluſia.

"It does not appear to me that much ſtreſs may be laid on the difficulty and hazard that birds muſt run in their migrations, by reaſon of vaſt oceans, croſs winds, &c.; becauſe, if we reflect, a bird may travel from England to the equator without launching out and expoſing itſelf to boundleſs ſeas, and that by croſſing the water at Dover and again at Gibraltar. And I with the more confidence advance this obvious remark, becauſe my brother has always found that ſome of his birds, and particularly the ſwallow kind, are very ſparing of their pains in croſſing the Mediterranean: for when arrived at Gibraltar, they do not,

———"rang'd in figure, wedge their way,
—————"and ſet forth
"Their airy caravan high over ſeas
"Flying, and over lands with mutual wing
"Eaſing their flight:" Milton.

but ſcout and hurry along in little detached parties of ſix or ſeven in a company; and ſweeping low, juſt over the ſurface of the land and water, direct their courſe to the oppoſite continent at the narroweſt paſſage they can find. They uſually ſlope acroſs the bay to the ſouth-weſt, and ſo paſs over oppoſite to Tangier, which it ſeems is the narroweſt ſpace.

"In former letters we have conſidered whether it was probable that woodcocks in moon-ſhiny nights croſs the German ocean from Scandinavia. As a proof that birds of leſs ſpeed may paſs that ſea, conſiderable as it is, I ſhall relate the following incident, which, though mentioned to have happened ſo many years ago, was ſtrictly matter of fact:—As ſome people were ſhooting in the pariſh of Trotton, in the county of Suſſex, they killed a duck in that dreadful winter 1708-9, with a ſilver collar about its neck (I have read a like anecdote of a ſwan), on which were engraven the arms of the king of Denmark. This anecdote the rector of Trotton at that time has often told to a near relation of mine; and, to the beſt of my remembrance, the collar was in the poſſeſſion of the rector.

"At preſent I do not know any body near the ſeaſide that will take the trouble to remark at what time of the moon woodcocks firſt come. One thing I uſed to obſerve when I was a ſportſman, that there were times in which woodcocks were ſo ſluggiſh and ſleepy that they would drop again when fluſhed juſt before the ſpaniels, nay juſt at the muzzle of a gun that had been fired at them: whether this ſtrange lazineſs was the effect of a recent fatiguing journey, I ſhall not preſume to ſay.

"Nightingales not only never reach Northumberland and Scotland, but alſo, as I have been always told, Devonſhire and Cornwall. In thoſe two laſt countries we cannot attribute the failure of them to the want of warmth: the defect in the weſt is rather a preſumptive argument that theſe birds come over to us from the continent at the narroweſt paſſage, and do not ſtroll ſo far weſtward."

Migration of Fiſhes. See Clupea.

St MIGUEL, one of the Azore iſlands, ſituated in W. Long. 22. 45. N. Lat. 38. 10. This iſland appears to be entirely volcanic. The beſt account we have of it hath been publiſhed in the 68th volume of the Philoſophical Tranſactions by Mr Francis Maſſon. According to him the productions differ greatly from thoſe of Madeira, inſomuch that none of the trees of the latter are found here, except the faya: it has a nearer affinity to Europe than Africa. The mountains are covered with the erica vulgaris, and an elegant ever-green ſhrub very like a phillyrea, which gives them a moſt beautiful appearance.

It is one of the principal and moſt fertile of the Azorian iſlands, lying nearly eaſt and weſt. Its length is about 18 or 20 leagues; its breadth unequal, not exceeding five leagues, and in ſome places not more than two. It contains about 80,000 inhabitants.

Its capital, the city of Ponta del Guda, which contains about 12,000 inhabitants, is ſituated on the ſouth ſide of the iſland, on a fine fertile plain country, pretty regularly built; the ſtreets ſtraight, and of a good breadth. It is ſupplied with good water, which is brought about the diſtance of three leagues from the neighbouring mountains. The churches and other religious edifices are elegant and well built for ſuch an iſland. There is a large convent of Franciſcan friars and one of the order of St Auguſtin, four convents for profeſſed nuns, and three Recolhimentos for young women and widows who are not profeſſed. The veſſels anchor in an open road; but it is not dangerous, as no wind can prevent their going to ſea in caſe of ſtormy weather.

The country round the city is plain for ſeveral miles, well cultivated, and laid out with good taſte into ſpacious fields, which are ſown with wheat, barley, Indian corn, pulſe, &c. and commonly produce annually two crops; for as ſoon as one is taken off, another is immediately ſown in its place. The ſoil is remarkably gentle and eaſy to work, being for the moſt part compoſed of pulveriſed pumice-ſtone. There are in the plains a number of pleaſant country-ſeats, with orchards of orange-trees, which are eſteemed the beſt in Europe.

The ſecond town is Ribeira Grande, ſituated on the north ſide of the iſland, containing about as many inhabitants as the city; a large convent of Franciſcan friars, and one of nuns. It gives title to a count, called the *Conde Ribeira Grande*, who firſt inſtituted linen and woollen manufactories in the iſland.

The third town is Villa Franca, on the ſouth ſide of the iſland, about ſix leagues eaſt of Ponta del Guda. It has a convent of Franciſcan friars, and one of nuns, which contains about 300. Here, about half a mile from the ſhore, lies a ſmall iſland (Ilhao), which is hollow in the middle, and contains a fine baſon with only one entrance into it, fit to hold 50 ſail of veſſels ſecure from all weather; at preſent it wants cleaning out, as the winter rain waſhes down great quantities of earth into it, which has greatly diminiſhed its depth. But veſſels frequently anchor between this iſland and the main.

Beſide theſe towns are ſeveral ſmaller, *viz.* Alagoa, Agoa de Pao, Brelanha, Fanaes de Ajuda, and a number of hamlets, called *lugars* or *places*.

About four leagues north-eaſt from Villa Franca, lies a place called the *Furnas*, being a round deep valley in the middle of the eaſt part of the iſland, ſurrounded with high mountains, which, though ſteep, may be eaſily aſcended on horſeback by two roads. The valley is about five or ſix leagues in circuit. The face of the mountains, which are very ſteep, is entirely covered with beautiful ever-greens, *viz.* myrtles, laurels, a large ſpecies of bilberry called *uva de ſerra*, &c. and numberleſs rivulets of the pureſt water run down their ſides. The valley below is well cultivated, producing wheat, Indian corn, flax, &c. The fields are planted round with a beautiful ſort of poplars, which grow into pyramidal forms, and by their careleſs, irregular diſpoſition, together with the multitude of rivulets, which run in all directions through the valley, a number of boiling fountains throwing up clouds of ſteam, a fine lake in the ſouth-weſt part about two leagues round, compoſe a proſpect the fineſt that can be imagined. In the bottom of the valley the roads are ſmooth and eaſy, there being no rocks but a fine pulveriſed pumice ſtone that the earth is compoſed of.

There are a number of hot fountains in different parts of the valley, and alſo on the ſides of the mountains: but the moſt remarkable is that called the *chaldeira*, ſituated on the eaſtern part of the valley, on a ſmall eminence by the ſide of a river, on which is a baſon about 30 feet diameter, where the water continually boils with prodigious fury. A few yards diſtant from it is a cavern in the ſide of the bank, in which the water boils in a dreadful manner, throwing out a thick, muddy, unctuous water ſeveral yards from its mouth with a hideous noiſe. In the middle of the river are ſeveral places where the water boils up ſo hot, that a perſon cannot dip his finger into it without being ſcalded; alſo along its banks are ſeveral apertures, out of which the ſteam riſes to a conſiderable height, ſo hot that there is no approaching it with one's hand: in other places, a perſon would think that 100 ſmiths bellows were blowing altogether, and ſulphureous ſteams iſſuing out in thouſands of places; ſo that native ſulphur is found in every chink, and the ground covered with it like hoar-froſt; even the buſhes that happen to lie near theſe places are covered with pure brimſtone, condenſing from the ſteam that iſſues out of the ground, which in many places is covered over with a ſubſtance like burnt alum. In theſe ſmall caverns, where the ſteam iſſues out, the people often boil their yams.

Near theſe boiling fountains are ſeveral mineral ſprings; two in particular, whoſe waters have a very ſtrong quality, of an acid taſte, and bitter to the tongue.

About half a mile to the weſtward, and cloſe by the river ſide, are ſeveral hot ſprings, which are uſed by ſick people with great ſucceſs. Alſo, on the ſide of a hill weſt of St Ann's church, are many others, with three bathing-houſes, which are moſt commonly uſed. Theſe waters are very warm, although not boiling hot; but at the ſame place iſſue ſeveral ſtreams of cold mineral water, by which they are tempered, according to every one's liking.

About a mile ſouth of this place, and over a low ridge of hills, lies a fine lake about two leagues in circumference, and very deep, the water thick, and of a greeniſh colour. At the north end is a plain piece of ground, where the ſulphureous ſteams iſſue out in many places, attended with a ſurpriſing blowing noiſe. Our author could obſerve ſtrong ſprings in the lake, but could not determine whether they were hot or cold: this lake ſeems to have no viſible evacuation. The other ſprings immediately form a conſiderable river, called *Ribeira Quente*, which runs a courſe about two or three leagues, through a deep rent in the mountains, on each ſide of which are ſeveral places where the ſmoke iſſues out. It diſcharges itſelf into the ſea on the ſouth ſide, near which are ſome places where the water boils up at ſome diſtance in the ſea.

This wonderful place had been taken little notice of until very lately: ſo little curioſity had the gentlemen of the iſland, that ſcarcely any of them had ſeen it, until of late ſome perſons, afflicted with very virulent diſorders, were perſuaded to try its waters, and found immediate relief from them. Since that time it has become more and more frequented; ſeveral perſons who had loſt the uſe of their limbs by the dead palſy have been cured; and alſo others who were troubled with eruptions on their bodies.

A clergyman who was greatly afflicted with the gout, tried the ſaid waters, and was in a ſhort time perfectly cured, and has had no return of it ſince. When Mr Maſſon was there, ſeveral old gentlemen, who were quite worn out with the ſaid diſorder, were uſing the waters, and had received incredible benefit from them; in particular, an old gentleman about 60 years of age, who had been tormented with that diſorder more than 20 years, and often confined to his bed for ſix months together: he had uſed theſe waters about three weeks, had quite recovered the uſe of his limbs, and walked about in the greateſt ſpirits imaginable. A friar alſo who had been troubled with the ſaid diſorder about 12 years, and reduced to a cripple, by uſing them a ſhort time was quite well, and went a-hunting every day.

There are ſeveral other hot ſprings in the iſland, particularly at Ribeira Grande; but they do not poſſeſs the ſame virtues, at leaſt not in ſo great a degree.

The eaſt and weſt part of the iſland riſes into high mountains; but the middle is low, interſperſed with round conic hills, all of which have very recent marks of fire; all the parts below the ſurface conſiſting of melted lava lying very hollow.

Moſt of the mountains to the weſtward have their tops hollowed out like a punch-bowl, and contain water. Near the weſt end is an immenſe deep valley like the Furnas called the *Sete Cidades*. This valley is ſurrounded with very abrupt mountains, about ſeven or eight leagues round; in the bottom is a deep lake of water, about three leagues in circuit, furniſhed with great numbers of water-fowls. This water has no mineral quality; neither are there any hot ſprings in the valley. All theſe mountains are compoſed of a white crumbly pumice-ſtone, which is ſo looſe, that if a perſon thruſt a ſtick into the banks, whole waggon-loads of it will tumble down. The inhabitants of the iſland relate a ſtory, that he who firſt diſcovered it obſerved an extraordinary high peak near the weſt end; but the ſecond time he viſited it, no ſuch peak was to be ſeen, which he ſuppoſed muſt have certainly ſunk: but, however improbable this ſtory may be, at ſome period or another it muſt have certainly been the caſe.

MILAN, or the duchy of the Milaneſe, a country of Italy, bounded on the weſt by Savoy, Piedmont, and Montferrat; by Switzerland on the north; by the territories of Venice, the duchies of Mantua, Parma, and Placentia, on the eaſt; and by the territories of Genoa on the ſouth.

Anciently this duchy, containing the north part of the old Liguria, was called *Inſubria*, from its inhabitants the *Inſubres;* who were conquered by the Romams, as theſe were by the Goths; who in their turn were ſubdued by the Lombards. Didier, the laſt king of the Lombards, was taken priſoner by Charlemagne, who put an end to the Longobardic empire, and appointed governors of Milan. Theſe governors, being at a diſtance from their maſters, ſoon began to aſſume an independency, which brought a dreadful calamity on the country; for, in 1153, the capital itſelf was levelled with the ground by the emperor Frederic Barbaroſſa, who committed great devaſtations otherwiſe throughout the duchy. Under this emperor lived one Galvian, a nobleman who was deſcended from Otho a Milaneſe. Galvian, along with William prince of Montferrat, ſerved in the cruſade, when Godfrey of Boulogne took Jeruſalem: he killed in ſingle combat the Saracen general, whom he ſtripped of his helmet, which was adorned with the image of a ſerpent ſwallowing a youth; and this ever afterwards was the badge of that family. His grandſon Galvian, having oppoſed the emperor, was taken priſoner, and carried in irons into Germany, from whence he made his eſcape and returned to Milan, died in the ſervice of his country. From him deſcended another Otho, at the time that Otho IV. was emperor of Germany, and who ſoon diſtinguiſhed himſelf by the accompliſhments both of his mind and body. When he grew up, he was received into the family of cardinal Octavian Ubaldini at Rome. This prelate, who was himſelf aſpiring at the popedom, was in a ſhort time greatly taken with the addreſs and accompliſhments of young Otho, and predicted his future greatneſs. In the mean time, one Torreſs, or Torriano, a Milaneſe nobleman of unbounded ambition, was attempting to make himſelf maſter of Milan. The popular faction had ſome time before been caballing againſt the nobility; and at laſt, Torriano, putting himſelf at their head, expelled the biſhop, and put to death or baniſhed, all the nobility: by which means the popular government was fully eſtabliſhed; and Torriano, under this pretence, ruled every thing as he pleaſed. He was, however, ſoon oppoſed by one Franciſco Sepri, who formed a great party, pretending to deliver the city from Torriano's haughtineſs and cruelty. But while the two parties were collecting their forces againſt each other, cardinal Ubaldini was projecting the deſtruction of both, by means of his favourite Otho. This prelate had for ſome time borne an implacable hatred to Torriano, becauſe he had been by him prevented from carrying out of the treaſury of St Ambroſe's church at Milan, a carbuncle or jewel of great value, which he pretended to reſerve for adorning the papal tiara; for which reaſon he now determined to oppoſe his ambition.

Ubaldini began with naming Otho archbiſhop of Milan; which, as the pope's legate, he had a right to do. This nomination was confirmed by Pope Urban IV.; and the party of the nobility having now got a head from the pope himſelf, began to gather ſtrength. Otho in the mean time employed himſelf in collecting troops; and had no ſooner procured a ſhow of an army, than he advanced towards Lago Maggione, and took poſſeſſion of Arona, a ſtrong poſt near that lake: but Torriano, marching immediately againſt him with all his troops, obliged him to abandon the place, and leave his party to make the beſt terms they could with the conqueror. This was followed by the deſtruction of the caſtles of Arona, Anghiari, and Brebia: ſoon after which Torriano died, and was ſucceeded by his brother Philip, who had ſufficient intereſt to get himſelf elected podeſta, or prætor of Milan, for ten years. During his lifetime, however, the party of the nobility increaſed conſiderably under Otho, notwithſtanding the check they had received. Philip died in 1265, having loſt ground conſiderably in the affections of the people, though he obtained a great reputation for his courage and conduct. His ſucceſſor Napi rendered himſelf terrible to nobility, whom he proſcribed, and put to death as often as he could get them into his power. He proceeded ſuch lengths, and acted with ſuch fury againſt that unfortunate party, that pope Clement IV. who had ſucceeded Urban, at laſt interdicted Milan, and excommunicated Napi and all his party. By this Napi began to loſe his popularity, and the public diſaffection towards him was much heightened by the natural cruelty of his temper. But in the mean time, the party of the nobility was in the utmoſt diſtreſs. Otho himſelf and his friends, having ſpent all their ſubſtance, wandered about from place to place; the pope not being in a capacity of giving them any aſſiſtance. Otho, however, was not diſcouraged by his bad ſucceſs, but found means ſtill to keep up the ſpirits of his party, who now choſe for their general Squarcini Burri, a man of great eminence and courage, whoſe daughter was married to Matthew Viſconti, afterwards called *Matthew the great*. At the ſame time they renewed their confederacy with the marquis of Montferrat, who was ſon-in-law to the king of Spain. The marquis agreed to this confederacy chiefly with a view to become maſter of the Milaneſe.

The nobility now again began to make head; and having collected an army, which was joined by 600 Spaniſh cavalry and a body of foot, gained ſome advantages. But in the mean time Napi, having gathered together a ſuperior army, ſuddenly attacked Otho and Burri, and defeated them. After this diſaſter Otho applied to the pope; from whom, however, he did not obtain the aſſiſtance he deſired; and in the mean time Napi invited the emperor Rodolph into Italy, with the promiſe of being crowned at Milan. This invitation was accepted of with great readineſs by Rodolph; who conſtituted Napi his governor and vicar-general in Lombardy, ſending to him at the ſame time a fine body of German horſe, the command of which was given to Caſſoni, Napi's nephew. On this Otho again applied to the pope (Gregory X.); but he was ſo far from granting him any aſſiſtance, that he is ſaid to have entered into a ſcheme of aſſaſſinating him privately; but Otho eſcaped the danger, and in 1276 began to recover his affairs. The reaſon of pope Gregory's enmity to him was, that he and his party were thought to be Gibelines, and were oppoſed by great numbers of the nobility themſelves; but after that pope's death, the Milaneſe exiles being united under one head, ſoon became formidable. They now choſe for their general Godfrey count of Languſio, a noble Pavian, and an inveterate enemy of the Torriano family. This nobleman being rich and powerful, enliſted many German and other mercenaries, at whoſe head he marched towards the Lago Maggiore. All the towns in that country opened their gates to him, through the intereſt of the Viſconti family, who reſided in theſe parts. But this ſucceſs ſoon met with a ſevere check in an unfortunate engagement, wherein Godfrey was defeated and taken priſoner; after which he and 34 nobles had their heads ſtruck off, and ſent from the field of battle piled up in a common waggon.

This defeat greatly affected Otho; but having in a ſhort time recovered himſelf, he again attacked his enemies, and defeated them; but, ſuffering his troops to grow remiſs after their victory, the fugitives rallied, and entirely defeated him. The next year, however, Otho had better ſucceſs, and totally defeated and took priſoner Napi himſelf. After this victory Caſſoni was obliged to abandon Milan to his competitor, who kept poſſeſſion of it till his death, which happened in 1295, in the 87th year of his reign.

Otho was ſucceeded by Matthew Viſconti abovementioned; and Milan continued in ſubjection to that family without any very memorable occurrence till the year 1378, when, by the death of Galeazzo II. his brother Barnabo became ſovereign of Milan. He was of a brave and active diſpoſition; but exceſſively profuſe in his expences, as his brother Galeazzo had alſo been; and to procure money to ſupply his extravagancies, was obliged to oppreſs his ſubjects. Galeazzo had engaged in an enterprize againſt Bologna, and the ſiege of it was continued by Barnabo. It laſted for nine years; and during this time is ſaid to have coſt 300 millions of gold, a prodigious ſum in thoſe days, near 40 millions ſterling; the loweſt gold coin being in value ſomewhat more than half-a-crown Engliſh. Both the brothers were exceſſively fond of building. Barnabo erected a bridge over the Adda, conſiſting of three ſtories; the loweſt for chariots and heavy carriages, the middle for horſes, and the uppermoſt for foot-paſſengers. He built alſo another bridge, which was carried over houſes without touching them. To accompliſh theſe, and many other expenſive ſchemes, he became one of the greateſt tyrants imaginable, and every day produced freſh inſtances of his rapacity and cruelty. He inſtituted a chamber of inquiry, for puniſhing all thoſe who had for five years before been guilty of killing boars, or even of eating them at the table of another. They who could not redeem themſelves by money were hanged, and above 100 wretches periſhed in that manner. Thoſe who had any thing to loſe were ſtripped of all their ſubſtance, and obliged to labour at the fortifications and other public works. He obliged his ſubjects to maintain a great many hunting-dogs, and each diſtrict was taxed a certain number. The overſeers of his dogs were at the ſame time the inſtruments of his rapacity. When the dogs were poor and ſlender, the owners were always fined; but when the dogs were fat, the owners were alſo fined for ſuffering them to live without exerciſe.

The extravagant behaviour of Barnabo ſoon rendered public affairs ready for a revolution, which was at laſt accompliſhed by his nephew John Galeazzo. He affected a ſolitary life, void of ambition, and even inclining to devotion; but at the ſame time took care to have his uncle's court filled with ſpies, who gave him information of all that paſſed. He reduced his table and manner of living, pretending that he took theſe ſteps as preparatives to a retirement from the world, which was ſoon to take place, after he had paid a religious vow. In ſhort, he acted his part ſo well, that even Barnabo, though abundantly cautious, had no ſuſpicion of his having any deſigns againſt him; and ſo entirely did he conceal his ambition, that he ſeveral times made application to his uncle for his intereſt to procure him a quiet retreat as ſoon as his religious vows were performed. One of theſe was to pay a viſit to the church of the bleſſed Virgin upon mount Varezzio. This was to be done with ſo much ſecrecy that all kinds of eye-witneſſes were to be excluded; and it was with difficulty that Barnabo himſelf and two of his ſons were allowed to accompany our devotee. But, in the mean time, the hypocritical Galeazzo had ſoldiers advancing from all quarters; ſo that Barnabo and his ſons were immediately ſeized, and the houſes of thoſe who had ſided with them given up to be plundered. The booty in plate, money, and all kinds of rich furniture, was immenſe. The miniſters of the late government were dragged from their hiding-places, and put to death; and at laſt the citadel itſelf fell into the hands of Galeazzo, who found in it an immenſe ſum of money. Barnabo was carried priſoner to Tritici, a caſtle of his own building, where he had the happineſs to find one perſon ſtill faithful to him. This was his miſtreſs, named *Doninia Porra*; who, when he was abandoned by all the world, ſhut herſelf up a voluntary priſoner in his chamber, and remained with him as long as he lived, which was only ſeven months after his degradation.

John Galeazzo was the firſt who took upon him the title of the *duke of Milan*, and was a prince of great policy and no leſs ambition. He made war with the Florentines, became maſter of Piſa and Bologna, and entirely defeated the emperor in 1401, ſo that he entertained hopes of becoming maſter of all Lombardy, and cutting off all poſſibility of invading it either from France or Germany; but his deſigns were fruſtrated by death, which happened in 1402, in the 55th year of his age. After his deceaſe the Milaneſe government fell into the moſt violent diſtractions, ſo that it could not be ſupported, even in time of peace, without an army of 20,000 foot and as many horſe. In the year 1421, however, Philip duke of Milan became maſter of Genoa; but though he gained great advantages in all parts of Italy, the different ſtates ſtill found means to counterbalance his ſucceſſes, and prevent him from enſlaving them: ſo that Milan never became the capital of any extenſive empire; and in 1437 Genoa revolted, and was never afterwards reduced.

Philip died in 1448, and by his death the male line of the Viſconti family was at an end. The next lawful heir was Valentina his ſiſter, who had married the duke of Orleans ſon to Charles V. of France. By the contract of that marriage, the lawful progeny of it was to ſucceed to the duchy of Milan in failure of the heirs-male of the Viſconti family; but this ſucceſſion was diſputed by Sforza, who had married Philip's natural daughter. It is certain, however, that the rightful ſucceſſion was veſted in the houſe of Orleans and the kings of France; and therefore though the Sforza family got poſſeſſion of the duchy for the preſent, Louis XII. afterwards put in his claim, as being grandſon to John Galeazzo. For ſome time he was ſucceſsful; but the French behaved in ſuch an inſolent manner, that they were driven out of the Milaneſe by the Swiſs and Maximilian Sforza. The Swiſs and Milaneſe were in their turn expelled by Francis I. who obliged the Sforza family to relinquiſh the government for a penſion of 30,000 ducats a-year. Francis Sforza, the ſon of Maximilian, however, being aſſiſted by the emperor and the pope, regained the poſſeſſion of the Milaneſe about the year 1521; and, eight years after, the French king, by the treaty of Cambray, gave up his claim on the duchy.

But, in fact, the emperors of Germany ſeem to have had the faireſt title to the Milaneſe in right of their being for a long time ſovereigns of Italy. On the death of Francis Sforza, therefore, in the year 1536, the emperor Charles V. declared the Milaneſe to be an imperial fief, and granted the inveſtiture of it to his ſon Philip II. king of Spain. In his family it continued till the year 1706, when the French and Spaniards were driven out by the Imperialiſts, and the emperor again took poſſeſſion of it as a fief. It was confirmed to his houſe by the treaty of Baden in 1714, by the quadruple alliance in 1718, and by the treaty of Aix-la-Chapelle in 1748.

The duchy of Milan is one of the fineſt provinces in Italy. It is bounded on the ſouth by the Appenine mountains, and the territory of Genoa; on the north by Switzerland; on the eaſt by the Venetian territories, and the duchies of Mantua, Parma, and Placentia; and on the weſt by Savoy, Piedmont, and Montferrat; extending from north to ſouth about 100 miles, and from eaſt to weſt about 108. It is well watered by the Teſſino, the Seſia, the Adda, the Po, the Oglio, the Lombro, Serio, &c. and alſo by ſeveral canals and lakes. Of the latter the Lago Maggiore is between 30 and 40 miles in length, and in ſome places ſix or ſeven miles broad. In it lie the *Boromean Iſlands*, as they are called, viz. Iſola Bella and Iſola Madre, the beauty of which almoſt exceeds imagination: art and nature ſeem to have vied with one another in embelliſhing them. In each of them is a palace with delicious gardens, belonging to the Boromean family. The water of the lake is clear and of a greeniſh colour, and abounds with fiſh. The hills with which it is ſurrounded preſent a moſt charming landſcape, being planted with vines and cheſnut-trees, interſperſed with ſummer-houſes. There is a canal running from it towards Switzerland, with which the city of Milan has a communication. It was anciently called *Lacus Verbanus*. The Lago de Como, which was called by the Latin poets *Lacus Larius*, but had its modern name from the city, near which it lies, extends itſelf about 30 miles northward from Como, but its greateſt breadth is not above five miles. From the Lago Maggiore iſſues the Teſſino; and from that of Como the Adda. Of the other lakes, that of Lugano and Guarda are the chief: that of Guarda was anciently called *Benacus*.

The trade and manufactures of this duchy conſiſt principally in ſilks, ſtuffs, ſtockings, gloves, and handkerchiefs, linen and woollen cloth, hardware, curious works of cryſtal, agate, hyacinths, and other gems; but their exports are uſually far ſhort of their imports.

As to the revenue of the duchy, it muſt without doubt be very conſiderable. It is ſaid to have amounted to 2,000,000 of dollars while the duchy was in the hands of Spaniards.

In the year 1767, the Auſtrian government of Milan publiſhed a law, by which all the rights which the pope or the biſhops had till then exerciſed over eccleſiaſtics, either with regard to their effects or perſons, is transferred to a council eſtabliſhed for that purpoſe at Milan. By the ſame edict, all eccleſiaſtics were obliged to ſell the eſtates which they had become poſſeſſed of ſince the year 1722; and no ſubject, whether eccleſiaſtic or ſecular, was to go to Rome to ſolicit any favour, except letters of indulgence, without the conſent of the ſaid council.

Milan, the capital of the duchy of that name, in Latin *Mediolanum*, is a very large city, and has a wall and rampart round it, with a citadel; yet is thought to be incapable of making any great reſiſtance.—The gardens within the city take up a great deal of ground. In the citadel is a foundery for cannon, and an arſenal furniſhed with arms for 12,000 men. The governor of it is quite independent of the governor-general of the Milaneſe, who reſides in the city, in a large but old and ill-contrived palace. The yearly income of the governor of Milan is ſaid to be 200,000 guilders. The council belonging to the city is compoſed of a preſident and 60 doctors of law, who are all nobles, and independent of the governor-general. Milan hath experienced a great variety of fortune, having been ſubject ſometimes to the French, ſometimes to the Spaniards, and ſometimes to the Germans. A great number of perſons of rank and fortune live in it, eſpecially during the winter. The ladies in France are not allowed more liberty than thoſe of this city: even the auſterities of the monaſtic life are ſo far mitigated here, that gentlemen have not only the liberty of talking with the nuns, and of rallying and laughing at the grate, but alſo of joining with them in concerts of muſic, and of ſpending whole afternoons in their company. The place where the *beau monde* take the air, either in their coaches or on foot, is the rampart betwixt the Porta Orientale and the Porta Toſa, where it is ſtraight and broad, and extremely pleaſant, being planted with white mulberry-trees, and commanding a proſpect on one ſide of the open country, and on the other of the gardens and vineyards between the ramparts and the city. Milan, which is ſaid to have been built by the Gauls about 200 years after the foundation of Rome, contains a great number of ſtately edifices, as churches, convents, palaces, and hoſpitals. The cathedral is a vaſt pile, all of marble; and though ſomething has been doing for near 400 years towards the outward or inward ornament thereof, it is not yet finiſhed. Of the great number of ſtatues about it, that of St Bartholomew, juſt ſlead alive, with his ſkin hanging over his ſhoulders; and of Adam and Eve, over the main portal, are the fineſt. The pillars ſupporting the roof of the church are all of marble, and the windows finely painted. This church contains a treaſure of great value, particularly a ſhrine of rock-cryſtal, in which the body of St Charles Boromæo is depoſited. The other churches moſt worthy a ſtranger's notice are thoſe of St Alexander, St Jerom, St Giovanni de Caſarotti della Paſſione, that of the Jeſuits, and of St Ambroſe, in which lie the bodies of the ſaints and of the kings Pepin and Bernard. In the Ambroſian college, founded by Frederic Boromæo, 16 profeſſors teach gratis. In the ſame college is alſo an accademy of painting, with a muſeum, and a library containing a vaſt number of printed books and manuſcripts; among the laſt of which is a tranſlation of Joſephus's Hiſtory of the Jews, done by Rufinus about 1200 years ago, and written on the bark of a tree; St Ambroſe's works on vellum, finely illuminated; the orations of Gregory Nazianzen, and the works of Virgil, in folio, with Petrarch's notes. In the muſeum are Leonardi da Vinci's mathematical and mechanical drawings, in 12 large volumes. The ſeminary for ſciences, the college of the nobles, the Helvetian college, and the mathematical academy, are noble foundations and ſtately buildings. Of the hoſpitals, the moſt remarkable are the Lazaretto, and that called the *great hoſpital;* the latter of which receives ſick perſons, foundlings, and lunatics, and has ſix ſmaller hoſpitals depending on it, with a revenue of 100,000 rixdollars.

The number of the inhabitants of this city is ſaid to be about 200,000. It has been 40 times beſieged, taken 20 times, and four times almoſt entirely demoliſhed; yet it has always recovered itſelf. It is ſaid that gunpowder is ſold here only by one perſon, and in one place. The court of inquiſition is held in the Dominican convent, near the church of Madonna della Gratia. The houſes of entertainment, and the ordinaries here, are repreſented as very indifferent. Mr Keyſler ſays, it is not unuſual for young travellers, when they go to any of the taverns in Milan, to be aſked. "whether they chooſe a *letto fornito*, or female bed-fellow," who continues maſked till ſhe enters the bed-chamber. Milan is deſcribed as inferior to Turin both in beauty and conveniency: many of the ſtreets being crooked and narrow, and paper-windows much more frequent than in that city; even in grand palaces, the windows are often compoſed promiſcuouſly of glaſs and paper. Two large canals extend from hence, the one to the Teſſino, and the other to the Adda; the Teſſino having a communication with the Lago Maggiore, and, by a canal, with the Seſia; and the Adda iſſuing from the Lago di Como, and having a communication by canals with the Lambro and Serio. In a void ſpace in one of the ſtreets of Milan, where ſtood the houſe of a barber who had conſpired with the commiſſary of health to poiſon his fellow-citizens, is erected a pillar called *Colonna Infame*, with an inſcription to perpetuate the memory of the execrable deſign. The environs of this city are very pleaſant, being adorned with beautiful ſeats, gardens, orchards, &c. About two Italian miles from it, at the ſeat of the Simonetti family, is a building, that would have been a maſter-piece of its kind had the architect deſigned it for an artificial echo. It will return or repeat the report of a piſtol above 60 times; and any ſingle muſical inſtrument, well touched, will have the ſame effect as a great number of inſtruments, and produce a moſt ſurpriſing and delightful concert.

According to Dr Moore, "there is no place in Italy, perhaps in Europe, where ſtrangers are received in ſuch an eaſy hoſpitable manner as at Milan. Formerly the Milaneſe nobility diſplayed a degree of ſplendor and magnificence, not only in their entertainments, but in their uſual ſtyle of living, unknown in any other country in Europe. They are under a neceſſity at preſent of living at leſs expence, but they ſtill ſhow the ſame obliging and hoſpitable diſpoſition. This country having, not very long ſince, been poſſeſſed by the French, from whom it devolved to the Spaniards, and from them to the Germans, the troops of thoſe nations have, at different periods, had their reſidence here, and, in the courſe of theſe viciſſitudes, produced a ſtyle of manners, and ſtamped a character on the inhabitants of this duchy, different from what prevails in any other part of Italy; and nice obſervers imagine they perceive in Milaneſe manners the politeneſs, formality, and honeſty imputed to thoſe three nations, blended with the ingenuity natural to Italians. The great theatre having been burnt to the ground laſt year, there are no dramatic entertainments, except at a ſmall temporary play-houſe, which is little frequented; but the company aſſemble every evening in their carriages on the ramparts, and drive about, in the ſame manner as at Naples, till it is pretty late. In Italy, the ladies have no notion of quitting their carriages at the public walks, and uſing their own legs, as in England and France. On ſeeing the number of ſervants, and the ſplendor of the equipages which appear every evening at the Corſo on the ramparts, one would not ſuſpect that degree of depopulation, and diminution of wealth, which we are aſſured has taken place within theſe few years all over the Milaneſe; and which proceeds from the burdenſome nature of ſome late taxes, and the inſolent and oppreſſive manner in which they are gathered." E. Long. 15 35. N. Lat. 38. 32.

MILBORN-PORT, a town of Somerſetſhire in England, ſeated on a branch of the river Parret, 115 miles from London. Though it is repreſented in parliament, it is no market-town nor corporation; but it appears in Domeſday-book to have had a market once, and 56 burgeſſes. It is in a manner ſurrounded by Dorſetſhire. Here are nine capital burgeſſes, who yearly chooſe two bailiffs, that have the government of the borough under them, and jointly return the members of parliament with the two ſtewards, who are choſen yearly out of nine commonalty ſtewards, and have the cuſtody of the corporation-ſeal. Theſe two ſtewards alſo diſtribute the profits of the lands given to the poor here, of which the ſaid commonalty ſtewards are truſtees. The inhabitants are about 1100, the houſes not much above 200. There are two fairs, June 6th and October 28th.

MILBROOK, a town of Cornwall, on the weſt ſide of Plymouth-Haven. It has a good fiſhing-trade, and has formerly furniſhed the Britiſh fleet with many able hands.

MILDENHALL, a town of Suffolk, ſeven miles from Newmarket, 12 from Bury, and 70 from London. It is a large populous town on the river Lark, a branch of the Ouſe, with a harbour for boats. It has a well-frequented market on Friday, eſpecially for fiſh and wild-fowl. Its church has a tower or ſteeple 120 feet high.

MILDEW, is ſaid to be a kind of thick, clammy, ſweet juice, exhaled from, or falling down upon, the leaves and bloſſoms of plants. By its thickneſs and clammineſs it prevents perſpiration, and hinders the growth of the plant. It ſometimes reſts on the leaves of trees in form of a fatty juice, and ſometimes on the ears of corn. It is naturally very tough and viſcous, and becomes ſtill more ſo by the ſun's heat exhaling its more fluid parts; by which means the young ears of corn are ſo daubed over, that they can never arrive at their full growth. Bearded wheat is leſs ſubject to the mildew than the common ſort; and it is obſerved that newly-dunged lands are more liable to mildew than others. The beſt remedy is a ſmart ſhower of rain, and immediately afterwards a briſk wind. If the mildew is ſeen before the ſun has much power, it has been recommended to ſend two men into the field with a long cord, each holding one end; and drawing this along the field through the ears, the dew will be diſlodged from them, before the heat of the ſun is able to dry it to that viſcous ſtate in which it does the miſchief. Some alſo ſay, that lands which have for many years been ſubject to mildews, have been cured of it by ſowing ſoot along with the corn, or immediately after it.

Mr J. S. Segar, the author of a treatiſe upon this ſubject, obſerves, that the mildew is of ſuch a ſharp corroſive nature, that it raiſes bliſters on the feet of the ſhepherds who go barefoot, and even conſumes the hoofs of the cattle. He ſuſpects that it poſſeſſes ſome arſenical qualities, though he does not pretend to affirm this poſitively. Its pernicious influence, according to him, is rendered ſtill more powerful by a variety of circumſtances; ſuch as ſending the cattle into the fields too early in the ſpring; their drinking water mixed with ice, or but lately thawed; their being kept in ſtables that are too cloſe and filthy, and which are not ſufficiently aired. The ſame author conſiders the mildew as a principal cauſe of epidemical diſtempers among the cattle. The mildew producing theſe diſeaſes, he ſays, is that which dries and burns the graſs and leaves. It falls uſually in the morning, particularly after a thunder-ſtorm. Its poiſonous quality (which does not continue above 24 hours) never operates but when it has been ſwallowed immediately after its falling. The diſorder attacks the ſtomach, is accompanied with pimples on the tongue, loſs of appetite, a deſiccation of the aliments in the ſtomach, a cough, and difficulty of reſpiration. As a preſervative, the author preſcribes purging in ſpring and in winter. The medicine he adviſes is compoſed of 30 grains of ſulphur of antimony, and 60 grains of reſin of jalap. He is againſt vomiting, and every thing that is of a heating nature.

MILE, a meaſure of length or diſtance, containing eight furlongs. The Engliſh ſtatute-mile is 80 chains, or 1760 yards; that is, 5280 feet.

We ſhall here give a table of the miles in uſe among the principal nations of Europe, in geometrical paces, 60,000 of which make a degree of the equator.

	Geometrical paces.
Mile of Ruſſia	750
of Italy	1000
of England	1200
of Scotland and Ireland	1500
Old league of France	1500
The ſmall league, *ibid.*	2000
The mean league, *ibid.*	2500
The great league, *ibid.*	3000
Mile of Poland	3000
of Spain	3428
of Germany	4000
of Sweden	5000
of Denmark	5000
of Hungary	6000

MILETUS (anc. geog.), a town of Crete mentioned by Homer; but where ſituated does not appear. It is ſaid to be the mother-town of Miletus in Caria, whither a colony was led by Sarpedon, Minos's brother, (Ephorus, quoted by Strabo). *Mileſii*, the people, (Ovid).

MILETUS (anc. geog.), a celebrated town of Aſia Minor, on the confines of Ionia and Caria. It was the capital city of all Ionia, and famous both for the arts of war and peace. It was ſituated about 10 ſtadia ſouth of the mouth of the river Mæander, near the ſea-coaſt. It was founded by a Cretan colony under Miletus, the companion of Bacchus; or (according to others) by Neleus the ſon of Codrus; or by Sarpedon a ſon of Jupiter. It has ſucceſſively been called *Lelegeis*, *Pithyuſa*, and *Anactoria*. The inhabitants, called *Mileſii*, were very powerful, and long maintained an obſtinate war againſt the kings of Lydia. They early applied themſelves to navigation; and planted no leſs than 80 colonies, or (according to Seneca) 380, in different parts of the world. It was the only town that made head againſt Alexander, and was with much difficulty taken. It gave birth to Thales, one of the ſeven wiſe men, and the firſt who applied himſelf to the ſtudy of nature. It was alſo the country of Anaximander, the ſcholar and ſucceſſor of Thales, the inventor of ſun-dials and the gnomon, and the firſt that publiſhed a geographical map; of Anaximance, ſcholar and ſucceſſor to the foregoing; and of other great men. It was noted for its excellent wool, according to Virgil; and was alſo celebrated for a temple and oracle of Apollo Didymæus. This famous people, from being powerful, becoming afterwards opulent and abandoned to pleaſures, loſt both their riches and their power.—At preſent it is called by the Turks *Melas*, and not far diſtant from it runs the river Mæander. St Paul going from Corinth to Jeruſalem paſſed by Miletus, and as he went by ſea, and could not take Epheſus in his way, he cauſed the biſhops and prieſts of the church of Epheſus to come to Miletus (Acts xx. 15. &c.), which was about 12 leagues from them.

MILFOIL, or YARROW. See ACHILLEA.

MILFORD, a town of Suſſex-county in the Delaware ſtate, is ſituated at the ſource of a ſmall river, 15 miles from Delaware bay, and 150 ſouthward of Philadelphia. This town, which contains about 100 houſes, has been built, except one houſe, ſince the revolution. It is laid out with much taſte, and is by no means diſagreeable. The inhabitants are Epiſcopalians, Quakers, and Methodiſts.

MILFORD-Haven, one of the fineſt harbours in Europe, and indiſputably the beſt in Britain, is ſituated in Pembrokeſhire in South-Wales, and lies on the north ſide of the Briſtol Channel. It is very large, ſafe, and deep; there is no danger of going in or out with the tide, or almoſt with any wind. If a ſhip comes in without a cable or anchor, ſhe may run aſhore on the ooze, and there lie ſafe till ſhe is refitted; and in an hour's time ſhe may get out of the harbour into the open ſea. It lies extremely convenient for ſhips bound from the Engliſh or Briſtol Channels to Ireland, or farther weſt, and from thence to the Channels. It is ſaid, that 1000 ſail of any ſize may ride ſecure in this haven. It has 16 deep and ſafe creeks, five bays, and 13 roads, all diſtinguiſhed by their ſeveral names. The ſpring tide riſes 36 feet; ſo that ſhips may at any time be laid aſhore. Dale harbour is a ready out-let for ſmall veſſels, where they may ride in two or three fathoms at low-wafer.—In the reign of Queen Elizabeth, before the Spaniſh invaſion, two forts were begun at the entrance of Milford-Haven; one on each ſide, called *Nangle* and *Dale* blockhouſes; but they were not then finiſhed.—The Stack-rock riſes here above water, lying near the middle of the entrance between Nangle and Dale. Penermouth is the opening of that branch of the haven on which the town of Pembroke is ſeated, and where the cuſtom-houſe of Milford is kept. The breadth of the entrance between rock and rock is but 200 yards at high-water, and 112 at low-water. There is a ridge of rocky ground that has the name of *Carrs*, which runs almoſt acroſs Milford-Haven, from Peter church towards Llanſtadwell, where it renders the landing place difficult to ſtrangers, from its not appearing at low-water. The great convenience of this harbour is, that in an hour's time a ſhip may be in or out of it, and in the way between the Land's end and Ireland. As it lies near the mouth of the Severn, a ſhip in eight or ten hours may be over on the coaſt of Ireland, or off the Land's-End in the Engliſh Channel; and a veſſel may get out hence to the weſt much ſooner than from either Plymouth or Falmouth. This harbour has been greatly improved by new works, at the expence of the government. The parliament, on April 14, 1759, granted 10,000 l. for fortifying the harbour of Milford, all of which was expended on the fort at Neyland, which, however, ſtill remains unfiniſhed.

MILIARY, in general, ſomething reſembling millet-ſeed.

MILIARY-Fever. See MEDICINE, n° 229.

MILITANT, or CHURCH-MILITANT, denotes the body of Chriſtians while here on earth.

MILITARY, ſomething belonging to the ſoldiery or militia.

MILITARY-Diſcipline, the training of ſoldiers, and the due enforcement of the laws and regulations inſtituted by authority for their conduct.

Next to the forming of troops, military diſcipline is the firſt object that preſents itſelf to our notice: it is the ſoul of all armies; and unleſs it be eſtabliſhed amongſt them with great prudence, and ſupported with unſhaken reſolution, they are no better than ſo many contemptible heaps of rabble, which are more dangerous to the very ſtate that maintains them than even its declared enemies.

MILITARY-Execution, the ravaging or deſtroying of a country or town that refuſes to pay the contribution inflicted upon them.

MILITARY-Exerciſe. See EXERCISE and WORDS *of Command*.

MILITARY-State, in Britiſh polity, one of the three diviſions of the laity. See LAITY.

This ſtate includes the whole of the ſoldiery, or ſuch perſons as are peculiarly appointed among the reſt of the people for the ſafeguard and defence of the realm.

In a land of liberty, it is extremely dangerous to make a diſtinct order of the profeſſion of arms. In abſolute monarchies, this is neceſſary for the ſafety of the prince; and ariſes from the main principle of their conſtitution, which is that of governing by fear: but, in free ſtates, the profeſſion of a ſoldier taken ſingly and merely as a profeſſion, is juſtly an object of jealouſy. In theſe no man ſhould take up arms but with a view to defend his country and its laws: he puts not off the citizen when he enters the camp; but it is becauſe he is a citizen, and would wiſh to continue ſo, that he makes himſelf for a while a ſoldier. The laws, therefore, and conſtitution of theſe kingdoms, know no ſuch ſtate as that of a perpetual ſtanding ſoldier, bred up to no other profeſſion than that of war; and it was not till the reign of Henry VII. that the kings of England had ſo much as a guard about their perſons.

In the time of the Anglo-Saxons, as appears from Edward the Confeſſor's laws, the military force of England was in the hands of the dukes or heretochs, who were conſtituted through every province and county in the kingdom; being taken out of the principal nobility, and ſuch as were moſt remarkable for being *ſapientes, fideles, et animoſi*. Their duty was to lead and regulate the Engliſh armies, with a very unlimited power; *prout eis viſum fuerit, ad honorem coronæ et utilitatem regni*. And becauſe of this great power they were elected by the people in their full aſſembly, or folkmote, in the ſame manner as ſheriffs were elected: following ſtill that old fundamental maxim of the Saxon conſtitution, that where any officer was entruſted with ſuch power, as, if abuſed, might terd to the oppreſſion of the people, that power was delegated to him by the vote of the people themſelves. So too, among the ancient Germans, the anceſtors of our Saxon forefathers, they had their dukes, as well as kings, with an independent power over the military, as the kings had over the civil ſtate. The dukes were elective, the kings hereditary: for ſo only can be conſiſtently underſtood that paſſage of Tacitus, *Reges ex nobilitate, duces ex virtute ſumunt.* In conſtituting their kings, the family or blood-royal was regarded: in chooſing their dukes or leaders, warlike merit: juſt as Ceſar relates of their anceſtors in his time, that whenever they went to war, by way either of attack or defence, they elected leaders to command them. This large ſhare of power, thus conferred by the people, though intended to preſerve the liberty of the ſubject, was perhaps unreaſonably detrimental to the prerogative of the crown: and accordingly we find a very ill uſe made of it by Edric duke of Mercia, in the reign of king Edmond Ironſide; who, by his office of duke or heretoch, was intitled to a large command in the king's army, and by his repeated treacheries at laſt transferred the crown to Canute the Dane.

It ſeems univerſally agreed by all hiſtorians, that king Alfred firſt ſettled a national militia in this kingdom, and by his prudent diſcipline made all the ſubjects of his dominions ſoldiers: but we are unfortunately left in the dark as to the particulars of this his ſo celebrated regulation; though, from what was laſt obſerved, the dukes ſeem to have been left in poſſeſſion of too large and independent a power: which enabled duke Harold, on the death of Edward the Confeſſor, though a ſtranger to the royal blood, to mount for a ſhort ſpace the throne of this kingdom, in prejudice of Edgar Etheling the rightful heir.

Upon the Norman conqueſt, the feodal law was introduced here in all its rigour, the whole of which is built on a military plan. In conſequence thereof, all the lands in the kingdom were divided into what were called *knight's fees*, in number above 60,000; and for every knight's fee a knight or ſoldier, *miles*, was bound to attend the king in his wars, for 40 days in a year; in which ſpace of time, before war was reduced to a ſcience, the campaign was generally finiſhed, and a kingdom either conquered or victorious. By this means the king had, without any expence, an army of 60,000 men always ready at his command. And accordingly we find one, among the laws of William the conqueror, which in the king's name commands and firmly enjoins the perſonal attendance of all knights and others; *quod habeant et teneant ſe ſemper in armis et equis, ut decet et oportet: et quod ſemper ſint prompti et parati ad ſervitium ſuum integrum nobis explendum et peragendum, cum opus adfuerit, ſecundum quod debent de feodis et tenementis ſuis de jure nobis facere.* This perſonal ſervice in proceſs of time degenerated into pecuniary commutations or aids; and at laſt the military part of the feodal ſyſtem was aboliſhed at the Reſtoration, by ſtatute 12 Car. II. c 24. See *Feodal-Syſtem*.

In the meantime, we are not to imagine that the kingdom was left wholly without defence in caſe of domeſtic inſurrections, or the proſpect of foreign invaſions. Beſides thoſe who by their military tenures, were bound to perform 40 days ſervice in the field, firſt the aſſize of arms, enacted 27 Hen. II. and afterwards the ſtatute of Wincheſter, under Edward I. obliged every man, according to his eſtate and degree, to provide a determinate quantity of ſuch arms as were then in uſe, in order to keep the peace; and conſtables were appointed in all hundreds by the latter ſtatute, to ſee that ſuch arms were provided. Theſe weapons were changed, by the ſtatute 4 & 5 Ph. & M. c. 2. into others of more modern ſervice; but both this and the former proviſions were repealed in the reign of James I. While theſe continued in force, it was uſual from time to time for our princes to iſſue commiſſions of array, and ſend into every county officers in whom they could confide, to muſter and array (or ſet in military order) the inhabitants of every diſtrict; and the form of the commiſſion of array was ſettled in parliament in the 5 Hen. IV. But at the ſame time it was provided, that no man ſhould be compelled to go out of the kingdom at any rate, nor out of his ſhire, but in caſes of urgent neceſſity; nor ſhould provide ſoldiers unleſs by conſent of parliament. About the reign of king Henry VIII. and his children, lord-lieutenants began to be introduced, as ſtanding repreſentatives of the crown, to keep the counties in military order; for we find them mentioned as known officers in the ſtatute 4 & 5 Ph. & M. c. 3. though they had not been then long in uſe; for Cambden ſpeaks of them in the time of Queen Elizabeth as extraordinary magiſtrates, conſtituted only in times of difficulty and danger.

In this ſtate things continued till the repeal of the ſtatutes of armour in the reign of king James I.; after which, when king Charles I. had, during his northern expeditions, iſſued commiſſions of lieutenancy, and exerted ſome military powers which, having been long exerciſed, were thought to belong to the crown, it became a queſtion in the long-parliament, how far the power of the militia did inherently reſide in the king; being now unſupported by any ſtatute, and founded only upon immemorial uſage. This queſtion, long agitated with great heat and reſentment on both ſides, became at length the immediate cauſe of the fatal rupture between the king and his parliament: the two houſes not only denying this prerogative of the crown, the legality of which claim perhaps might be ſomewhat doubtful; but alſo ſeizing into their hands the entire power of the militia, the illegality of which ſtep could never be any doubt at all.

Soon after the reſtoration of king Char. II. when the military tenures were aboliſhed, it was thought proper to aſcertain the power of the militia, to recogniſe the ſole right of the crown to govern and command them, and to put the whole into a more regular method of military ſubordination: and the order in which the militia now ſtands by law, is principally built upon the ſtatutes which were then enacted. It is true, the two laſt of them are apparently repealed; but many of their proviſions are re-enacted, with the addition of ſome new regulations, by the preſent militia-laws; the general ſcheme of which is to diſcipline a certain number of the inhabitants of every county, choſen by lot for three years, and officered by the lord-lieutenant, the deputy lieutenants, and other principal landholders, under a commiſſion from the crown. They are not compellable to march out of their counties, unleſs in caſe of invaſion or actual rebellion, nor in any caſe compellable to march out of the kingdom. They are to be exerciſed at ſtated times: and their diſcipline in general is liberal and eaſy; but, when drawn out into actual ſervice, they are ſubject to the rigours of martial law, as neceſſary to keep them in order. This is the conſtitutional ſecurity which the laws have provided for the public peace, and for protecting the realm againſt foreign or domeſtic violence; and which the ſtatutes declare is eſſentially neceſſary to the ſafety and proſperity of the kingdom.

When the nation was engaged in war, more veteran troops and more regular diſcipline were eſteemed to be neceſſary, than could be expected from a mere militia; and therefore at ſuch times more rigorous methods were put in uſe for the raiſing of armies and the due regulation and diſcipline of the ſoldiery: which are to be looked upon only as temporary excreſcences bred out of the diſtemper of the ſtate, and not as any part of the permanent and perpetual laws of the kingdom. For martial law, which is built upon no ſettled principles, but is entirely arbitrary in its deciſions, is, as Sir Mathew Hale obſerves, in truth and reality no law, but ſomething indulged rather than allowed as a law. The neceſſity of order and diſcipline in an army is the only thing which can give it countenance; and therefore it ought not to be permitted in time of peace, when the king's courts are open for all perſons to receive juſtice according to the laws of the land. Wherefore, Thomas earl of Lancaſter being convicted at Pontefract, 15 Edw. II. by martial law, his attainder was reverſed 1 Edw. III. becauſe it was done in time of peace. And it is laid down, that if a lieutenant, or other, that hath commiſſion of martial authority, doth in time of peace hang or otherwiſe execute any man by colour of martial law, this is murder; for it is againſt *magna charta*. And the petition of right enacts, that no ſoldier ſhall be quartered on the ſubject without his own conſent; and that no commiſſion ſhall iſſue to proceed within this land according to martial law. And whereas, after the Reſtoration, king Ch. II. kept up about 5000 regular troops, by his own authority, for guards and garriſons; which king James II. by degrees increaſed to no leſs than 30,000, all paid from his own civil liſt; it was made one of the articles of the bill of rights, that the raiſing or keeping a ſtanding army within the kingdom in time of peace, unleſs it be with conſent of parliament, is againſt law.

But as the faſhion of keeping ſtanding armies (which was firſt introduced by Charles VII. in France, 1445) has of late years univerſally prevailed over Europe (though ſome of its potentates, being unable themſelves to maintain them, are obliged to have recourſe to richer powers, and receive ſubſidiary penſions for that purpoſe), it has alſo for many years paſt been annually judged neceſſary by the legiſlature, for the ſafety of the kingdom, the defence of the poſſeſſions of the crown of Great Britain, and the preſervation of the balance of power in Europe, to maintain even in time of peace a ſtanding body of troops, under the command of the crown; who are however *ipſo facto* diſbanded at the expiration of every year, unleſs continued by parliament. And it was enacted by ſtatute 10 W. III. c. 1. that not more than 12,000 regular forces ſhould be kept on foot in Ireland, though paid at the charge of that kingdom: which permiſſion is extended by ſtat. 8. Geo. III. c. 13. to 16,235 men in time of peace.

To prevent the executive power from being able to oppreſs, ſays baron Monteſquieu, it is requiſite that the armies with which it is intruſted ſhould conſiſt of the people, and have the ſame ſpirit with the people; as was the caſe at Rome, till Marius new-modelled the legions by enliſting the rabble of Italy, and laid the foundation of all the military tyranny that enſued. Nothing then, according to theſe principles, ought to be more guarded againſt in a free ſtate, than making the military power, when ſuch a one is neceſſary to be kept on foot, a body too diſtinct from the people. Like this, therefore, it ſhould wholly be compoſed of natural ſubjects; it ought only to be enliſted for a ſhort and limited time; the ſoldiers alſo ſhould live intermixed with the people; no ſeparate camp, no barracks, no inland fortreſſes, ſhould be allowed. And perhaps it might be ſtill better, if, by diſmiſſing a ſtated number, and enliſting others at every renewal of their term, a circulation could be kept up between the army and the people, and the citizen and the ſoldier be more intimately connected together.

To keep this body of troops in order, an annual act of parliament likewiſe paſſes, "to puniſh mutiny and deſertion, and for the better payment of the army and their quarters." This regulates the manner in which they are to be diſperſed among the ſeveral inn-keepers and victuallers throughout the kingdom; and eſtabliſhes a law-martial for their government. By this, among other things, it is enacted, that if any officer or ſoldier ſhall excite, or join any mutiny, or, knowing of it, ſhall not give notice to the commanding officer, or ſhall deſert, or liſt in any other regiment, or ſleep upon his poſt, or leave it before he is relieved, or hold correſpondence with a rebel or enemy, or ſtrike or uſe violence to his ſuperior officer, or ſhall diſobey his lawful commands; ſuch offender ſhall ſuffer ſuch puniſhment as a court-martial ſhall inflict, though it extend to death itſelf.

However expedient the moſt ſtrict regulations may be in time of actual war, yet in times of profound peace, a little relaxation of military rigour would not, one ſhould hope, be productive of much inconvenience. And, upon this principle, though by the ſtanding laws (ſtill remaining in force, though not attended to) deſertion in time of war is made felony without benefit of clergy, and the offence is triable by a jury, and before the judges of the common law; yet, by the militia laws beforementioned, a much lighter puniſhment is inflicted for deſertion in time of peace. So, by the Roman law alſo, deſertion in time of war was puniſhed with death, but more mildly in time of tranquillity. But the mutiny-act makes no ſuch diſtinction: for any of the faults abovementioned are, equally at all times, puniſhable with death itſelf, if a court-martial ſhall think proper. This diſcretionary power of the court-martial is indeed to be guided by the direction of the crown; which, with regard to military offences, has almoſt an abſolute legiſlative power. "His Majeſty (ſays the act) may form articles of war, and conſtitute courts-martial, with power to try any crime by ſuch articles, and inflict ſuch penalties as the articles direct."

direct." A vaſt and moſt important truſt! an unlimited power to create crimes, and annex to them any puniſhments not extending to life or limb! Theſe are indeed forbidden to be inflicted, except for crimes declared to be ſo puniſhable by this act; which crimes we have juſt enumerated, and among which, we may obſerve, that any diſobedience to lawful commands is one. Perhaps in ſome future reviſion of this act, which is in many reſpects haſtily penned, it may be thought worthy the wiſdom of parliament to aſcertain the limits of military ſubjection, and to enact expreſs articles of war for the government of the army, as is done for the government of the navy; eſpecially as, by the preſent conſtitution, the nobility and gentry of the kingdom, who ſerve their country as militia officers, are annually ſubjected to the ſame arbitrary rule during their time of exerciſe.

One of the greateſt advantages of the law is, that not only the crimes themſelves which it puniſhes, but alſo the penalties which it inflicts, are aſcertained and notorious: nothing is left to arbitrary diſcretion; the king by his judges diſpenſes what the law has previouſly ordained, but is not himſelf the legiſlator. How much, therefore, is it to be regretted, that a ſet of men, whoſe bravery has ſo often preſerved the liberties of their country, ſhould be reduced to a ſtate of ſervitude in the midſt of a nation of freemen; for Sir Edward Coke will inform us, that it is one of the genuine marks of ſervitude, to have the law, which is our rule of action, either concealed or precarious; *Miſera eſt ſervitus, ubi jus eſt vagum aut incognitum.* Nor is this ſtate of ſervitude quite conſiſtent with the maxims of ſound policy obſerved by other free nations. For the greater the general liberty is which any ſtate enjoys, the more cautious has it uſually been in introducing ſlavery in any particular order or profeſſion. Theſe men, as baron Monteſquieu obſerves, ſeeing the liberty which others poſſeſs, and which they themſelves are excluded from, are apt (like eunuchs in the eaſtern ſeraglios) to live in a ſtate of perpetual envy and hatred towards the reſt of the community, and indulge a malignant pleaſure in contributing to deſtroy thoſe privileges to which they can never be admitted. Hence have many free ſtates, by departing from this rule, been endangered by the revolt of their ſlaves; while, in abſolute and deſpotic governments, where no real liberty exiſts, and conſequently no invidious compariſons can be formed, ſuch incidents are extremely rare. Two precautions are therefore adviſed to be obſerved in all prudent and free governments: 1. To prevent the introduction of ſlavery at all: or, 2. If it be already introduced, not to intruſt thoſe ſlaves with arms, who will then find themſelves an overmatch for the freemen. Much leſs ought the ſoldiery to be an exception to the people in general, and the only ſtate of ſervitude in the nation.

Blackſt. Comment.

But as ſoldiers, by this annual act, are thus put in a worſe condition than any other ſubjects; ſo, by the humanity of the ſtanding laws, they are in ſome caſes put in a much better. By ſtatute 43 Eliz. c. 3. a weekly allowance is to be raiſed in every county for the relief of ſoldiers that are ſick, hurt, and maimed: not forgetting the royal hoſpital of Chelſea for ſuch as are worn out in their duty. Officers and ſoldiers, that have been in the king's ſervice, are by ſeveral ſtatutes, enacted at the cloſe of ſeveral wars, at liberty to uſe any trade or occupation they are fit for, in any town in the kingdom (except the two univerſities), notwithſtanding any ſtatute, cuſtom, or charter to the contrary. And ſoldiers in actual military ſervice may make nuncupative wills, and diſpoſe of their goods, wages, and other perſonal chattels, without thoſe forms, ſolemnities, and expences, which the law requires in other caſes. Our law does not indeed extend this privilege ſo far as the civil law; which carried it to an extreme that borders upon the ridiculous: for if a ſoldier, in the article of death, wrote any thing in bloody letters on his ſhield, or in the duſt of the field with his ſword, it was a very good military teſtament.

Military Court. See Chivalry (*Court of*).

Military Tenures. See Tenure, Feodal System, and Knight.

Military Ways (*viæ militares*), are the large Roman roads which Agrippa procured to be made through the empire, in the time of Auguſtus, for the more convenient marching of troops and conveyance of carriages. N. Bergier has written the hiſtory of the origin, progreſs, and amazing extent, of theſe military roads, which were paved from the gates of Rome to the extreme parts of the empire. See Way.

MILITIA, in general, denotes the body of ſoldiers, or thoſe who make profeſſion of arms.

In a more reſtrained ſenſe, militia denotes the trained bands of a town or country, who arm themſelves, upon a ſhort warning, for their own defence. So that, in this ſenſe, militia is oppoſed to regular or ſtated troops. See *Military State*, and *Feodal Syſtem.*

MILIUM, millet, in botany; A genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina.* The calyx is bivalved, and uniflorous; the corolla is very ſhort: the ſtigmata pencil like.— There are five ſpecies; of which the moſt remarkable is the panicum, or common millet. This is a native of India, but is now commonly cultivated in many parts of Europe as an eſculent grain. It riſes, with a reed-like ſtalk, three or four feet high, and channelled: at every joint there is one reed-like leaf, which is joined on the top of the ſheath, and embraces and covers that joint of the ſtalk below the leaf; this ſheath is cloſely covered with ſoft hairs, but the leaf which is expanded has none. The top of the ſtalk is terminated by a large looſe panicle, which hangs on one ſide, having a chaffy flower, which is ſucceeded by a ſmall round ſeed. There are two varieties; one with white, and the other with black ſeeds; but they do not differ in any other particular. This plant is greatly cultivated in the oriental countries, and from whence we are annually furniſhed with it. It is ſeldom cultivated in Britain but in ſmall gardens, for feeding of poultry, where the ſeeds generally ripen very well. It is uſed as an ingredient in puddings, and is by ſome people greatly eſteemed. The ſeeds muſt be ſown in the beginning of April, upon a warm dry ſoil, but not too thick becauſe the plants divide into ſeveral branches, and ſhould have much room. When they come up they ſhould be cleaned from weeds; after which they will in a ſhort time get the better of them, and prevent the future growth. In Auguſt the ſeeds will ripen, when the plant muſt be cut down, and the ſeeds beaten out, as is practiſed for other grain; but if it is not protected from birds, they will devour it as ſoon as it begins to ripen.

MILK, a well-known fluid, prepared by nature in the breaſts of women, and the udders of other animals, for the nouriſhment of their young.—According to Dr Cullen [*], milk is a connecting and intermediate ſubſtance between animals and vegetables. It ſeems immediately to be ſecreted from the chyle, both being a white liquor of the ſame conſiſtence: it is moſt copiouſly ſecreted after meals, and of an aceſcent nature. In moſt animals who live on vegetables, the milk is aceſcent; and it is uncertain, though at the ſame time no obſervation proves the contrary, whether it is not ſo likewiſe in carnivorous animals. But, whatever be in this, it is certain, that the milk of all animals who live on vegetables is aceſcent. Milk being derived from the chyle, we thence conclude its vegetable nature; for in thoſe who live on both promiſcuouſly, more milk is got, and more quickly, from the vegetable than the animal food. Milk, however, is not purely vegetable; though we have a vegetable liquor that reſembles its taſte, conſiſtence, colour, aceſcency, and the ſeparability of the oily part, viz. an emulſion of the nuces oleoſæ and ferinaceous ſubſtances. But theſe want the coagulable part of milk, which ſeems to be of animal-nature, approacking to that of the coagulable lymph of the blood. Milk, then, ſeems to be of an intermediate nature, between chyle taken up from the inteſtines and the fully elaborated animal-fluid.

[*] Lect. on Mat. Med.

Its contents are of three kinds: firſt, an oily part, which, whatever may be ſaid concerning the origin of other oils in the body, is certainly immediately derived from the oil of the vegetables taken in, as with theſe it agrees very exactly in its nature, and would entirely if we could ſeparate it fully from the coagulable part. Another mark of their agreement is the ſeparability, which proves that the mixture has been lately attempted, but not fully performed. 2dly, Beſides this oily, there is a proper coagulable part; And, 3dly, Much water accompanies both, in which there is diſſolved a ſaline ſaccharine ſubſtance. Theſe three can be got ſeparate in cheeſe, butter, and whey; but never perfectly ſo, a part of each being always blended with every other part.

Nothing is more common, from what has been ſaid of its immediate nature, than to ſuppoſe that it requires no aſſimilation; and hence has been deduced the reaſon of its exhibition in the moſt weakly ſtate of the human body. But wherever we can examine milk, we always find that it coagulates, ſuffers a decompoſition, and becomes aceſent. Again, infants, who feed entirely on milk, are always troubled with eructations, which every body obſerves are not of the ſame quality with the food taken; and therefore it appears, that, like all other food, milk turns naturally aceſcent in the ſtomach, and only enters the chyle and blood in conſequence of a new recompoſition. It approaches then to the nature of vegetable aliment, but is not capable of its noxious vinous fermentation, and therefore has an advantage over it: neither from this quality, like animal-food, is it heating in the ſtomach, and productive of fever; though at the ſame time, from its quantity of coagulable matter, it is more nouriſhing than vegetables.

Milk is the food moſt univerſally ſuited to all ages and ſtates of the body; but it ſeems chiefly deſigned by nature as the food of infants. When animals are in the fœtus-ſtate, their ſolids are a perfect jelly, incapable of an aſſimilatory power. In ſuch a ſtate nature has perfectly aſſimilated food, as the albumen ovi in the oviparous, and in the viviparous animals certainly ſomewhat of the ſame kind, as it was neceſſary the veſſels ſhould be filled with ſuch a fluid as would make way for an after-aſſimilation. When the infant has attained a conſiderable degree of firmneſs, as when it is ſeparated from the mother, yet ſuch a degree of weakneſs ſtill remains as makes ſomewhat of the ſame indication neceſſary, it behoves the infant to have an alkaleſcent food ready prepared, and at the ſame time its noxious tendency to be avoided. Milk then is given, which is alkaleſcent, and at the ſame time, has a ſufficient quantity of acidity to correct that alkaleſcency. As the body advances in growth, and the alkaleſcent tendency is greater, the animal, to obviate that tendency, is led to take vegetable food, as more ſuited to its ſtrength of aſſimilation.

Dr Cullen obſerves, that milk is almoſt ſuited to all temperaments; and it is even ſo to ſtomachs diſpoſed to aceſcency, more than thoſe ſubſtances which have undergone the vinous fermentation; nay, it even cures the heart-burn, checks vinous fermentation, and precipitates the lees, when, by renewal of fermentation, the wine happens to be fouled. It therefore very properly accompanies a great deal of vegetable aliment; although ſometimes its aceſcency is troubleſome, either from a large proportion taken in, or from the degree of it; for, according to certain unaccountable circumſtances, different acids are formed in the ſtomach in different ſtates of the body; in a healthy body, *e. g.* a mild one; in the hypochondriac diſeaſe, one ſometimes as corroſive as the foſſil acid. When the acidity of milk is carried to a great degree, it may prove remarkably refrigerent, and occaſion cold crudities, and the recurrence of intermittent fevers. To take the common notion of its paſſing unchanged into the blood, it can ſuffer no ſolution. But if we admit its coagulum in the ſtomach, then it may be reckoned among ſoluble or inſoluble foods, according as that coagulum is more or leſs tenacious. Formerly rennet, which is employed to coagulate milk, was thought an acid; but, from late obſervations, it appears, that, if it be an acid it is very different from other acids, and that its coagulum is ſtronger than that produced by acids. It has been imagined, than a rennet is to be found in the ſtomachs of all animals, which cauſes coagulation of milk; but to Dr Cullen the coagulation of milk ſeems to be owing to a weak acid in the ſtomach, the relicts of our vegetable food, inducing, in healthy perſons, a weak and ſoluble coagulum: but in different ſtomachs this may be very different, in theſe becoming heavy and leſs ſoluble food, and ſometimes even evacuated in a coagulated undiſſolved ſtate both by ſtomach and ſtool.

As milk is aceſcent, it may be rendered ſometimes purgative by mixing with the bile; and ſome examples of this have been remarked. More commonly, however, it is reckoned among thoſe foods which occaſion coſtiveneſs.

Hoffman, in his experiments on milk, found that all kinds of it contained much water; and when this was diſſipated, found the reſiduum very different in their ſolubility. But we muſt not thence conclude, that the ſame inſolubility takes place in the ſtomach; for extracts made from vegetables with water are often very inſoluble ſubſtances, and hardly diffuſible through water itſelf: therefore, in Hoffman's extracts, if we may ſo call them, of milk, ſomewhat of the ſame kind might have appeared; and theſe ſubſtances, which in their natural ſtate were not ſo, might appear very inſoluble. However, we may allow that milk is always ſomehow inſoluble in the inteſtines, as it is of a drying nature, and as cheeſe, &c. is very coſtive. And this effect ſhows that milk is always coagulated in the ſtomach: for if it remained fluid, no fæces would be produced, whereas ſometimes very hard ones are obſerved. In the blood-veſſels, from its animal nature, it may be conſidered as nutritious; but when we conſider its vegetable contents, and aceſcency in the primæ viæ, we find that, like animal-food, it does not excite that degree of fever in the time of digeſtion, and that from its aceſcency it will reſiſt putrefaction. Hence its uſe in hectic fevers, which, whatever be their cauſe, appear only to be exacerbations of natural feveriſh paroxyſms, which occur twice every day, commonly after meals, and at night. To obviate theſe, therefore, we give ſuch an aliment as produces the leaſt exacerbation of theſe fevers: and of this nature is milk, on account of its aceſcent vegetable nature.

There appears alſo ſomewhat peculiar to milk, which requires only a ſmall exertion of the animal-powers in order to its aſſimilation; and beſides, in hectic complaints there is wanted an oily, bland food, approaching to the animal-nature; ſo that on all theſe accounts milk is a diet peculiarly adopted to them, and, in general, to moſt convaleſcents, and to thoſe of inflammatory temperaments. So far of milk in general. We ſhall now ſpeak of the particular kinds which are in common uſe.

The milk of women, mares, and aſſes, agree very much in their qualities, being very dilute, having little ſolid contents, and, when evaporated to dryneſs, having theſe very ſoluble, containing much ſaccharine matter, of a very ready aceſcency, and, when coagulated, their coagulum being tender and eaſily broke down. From this view they have leſs oil, and ſeem to have leſs coagulable matter than the reſt.

The milk of cows, ſheep, and goats, agree in oppoſite qualities to the three juſt mentioned; but here there is ſomewhat more of gradation. Cows milk comes neareſt to the former milk: goats milk is leſs fluid, leſs ſweet, leſs flatulent, has the largeſt proportion of inſoluble part after coagulation, and indeed the largeſt proportion of coagulable part; its oily and coagulable parts are not ſpontaneouſly ſeparable, never throwing out a cream, or allowng butter to be readily extracted from it. Hence the virtues of theſe milks are obvious, being more nouriſhing, though at the ſame time leſs eaſily ſoluble in weak ſtomachs, than the three firſt, leſs aceſcent than theſe, and ſo more rarely laxative, and peculiarly fitted for the diet of convaleſcents without fever. The three firſt again are leſs nouriſhing, more ſoluble, more laxative, as more aceſcent, and adapted to the convaleſcents with fever.

Theſe qualities, in particular milks, are conſiderably diverſified by different circumſtances. Firſt, different animals, living on the ſame diet, give a conſiderably different milk; for there ſeems to be ſomething in the conſtitution, abſtracting from the aliment, which conſtitutes a conſiderable diverſity of milk, not only in the ſame ſpecies of animals, but alſo in the ſame animal, at different ages, and at different diſtances after delivery: this applies to the choice of nurſes. Secondly, Milk follows the nature of the aliment more than any other juice in the human body, being more or leſs fluid and dilute, more or leſs ſolid and nouriſhing, in proportion as theſe qualities are more or leſs in the aliment. The nature of the aliment differs according to its time of growth, *e. g.* old graſs being always found more nouriſhing than young. Aliment, too, is always varied according to the ſeaſon, as that is warm or dry, moiſt or cloudy.

The milk of each particular kind of animal is fitter for particular purpoſes, when fed on proper food.—Thus the cow delights in the ſucculent herbage of the vale: if the ſheep be fed there he certainly rots, but on the higher and more dry ſide of the mountain he feeds pleaſantly and healthy; while the goat never ſtops near the bottom, but aſcends to the craggy ſummit: and certainly the milks of theſe animals are always beſt on their proper ſoil, and that of goats is beſt on a mountainous country. From a diſſertation of Linnæus, we have many obſervations concerning the diverſity of plants on which each animal chooſes to feed. All the Swediſh plants which could be collected together, were preſented alternately to domeſtic animals, and then it appeared that the goat lived on the greateſt variety, and even on many which were poiſonous to the reſt; that the cow choſe the firſt ſucculent ſhoots of the plant, and neglected the fructification; which laſt was preferred by the goat. Hence may be deduced rules, concerning the paſturage of different animals; *e. g.* Farmers find, that, in a paſture which was only fit to feed a certain number of ſheep, an equal number of goats may be introduced, while the ſheep are no leſs nouriſhed than before.

It is not eaſy to aſſign the difference between milk freſh-drawn and that detained in the open air for ſome time: but certainly there is ſome material one, otherwiſe nature univerſally would not have directed infants to ſucking; and indeed it ſeems, better than the other, fitted for digeſtion and nouriſhment. Phyſicians have ſuppoſed that this depended on the evaporation of ſome *ſpt. rector*: but our author cannot conceive any ſuch, except common water here; and beſides, theſe volatile parts can hardly be nutritious. A more plauſible account ſeems deducible from mixture: milk new-drawn has been but lately mixed, and is expoſed to ſpontaneous ſeparation, a circumſtance hurtful to digeſtion; none of the parts being, by themſelves, ſo eaſily aſſimilated as when they are all taken together. Hence, then, milk new drawn is more intimately blended, and therefore then is moſt proper to the weakly and infants.

Another difference in the uſe of milk expoſed for ſome time to the air, is taking it boiled or unboiled.

Phyſicians have generally recommended the former; but the reaſon is not eaſily aſſigned. Perhaps it is this: Milk kept for ſome time expoſed to the air has gone ſo far to a ſpontaneous ſeparation; whereas the heat thoroughly blends the whole, and hence its reſolution is not ſo eaſy in the ſtomach; and thus boiled milk is more coſtive than raw, and gives more fæces. Again, when milk is boiled, a conſiderable quantity of air is detached, as appears from the froth on the ſurface; and air is the chief inſtrument of fermentation in bodies; ſo that after this proceſs it is not liable to aceſcency: for theſe reaſons it is proper for the robuſt and vigorous.

Another difference of milk is, according as it is fluid or coagulated. The coagulated is of two kinds, as induced by rennet, or the natural aceſcency of the milk. The former preparation makes the firmer and leſs eaſily ſoluble coagulum; though, when taken with the whey unſeparated, it is leſs difficult of ſolution, though more ſo than any other coagulum in the ſame caſe. Many nations uſe the latter form, which is eaſier ſoluble, but very much aceſcent, and therefore, in point of ſolution, ſhould be confined to the vigorous, in point of aceſcency, to thoſe who live on alkaleſcent food; and in the laſt caſe, the Laplanders uſe it as their chief aceſcent condiment. From the ſame conſiderations it is more cooling, and in its other effects like all other aceſcent vegetables.

Milk by evaporation yields a ſweet ſaline matter, of which Dr Lewis gives the following proportions:

Twelve ounces of	Left of dry matter	From which water extracted a ſweet ſaline ſubſtance amounting to
Cows milk	13 drams.	1½ drams.
Goats milk	12½	1½
Human milk	8	6
Aſſes milk	8	6

The ſaline ſubſtance extracted from aſſes milk was white, and ſweet as ſugar; thoſe of the others brown or yellow, and conſiderably leſs ſweet; that from cows milk had the leaſt ſweetneſs of any.

On diſtilling 12 quarts of milk *in balneo mariæ*, at leaſt nine quarts of pure phlegm were obtained: the liquor which afterwards aroſe was acidulous, and by degrees grew ſenſibly more and more acid as the diſtillation was continued. After this came over a little ſpirit, and at laſt an empyreumatic oil. The remaining ſolid matter adhered to the bottom of the retort, in the form of elegant ſhining black flowers, which being calcined and elixated yielded a portion of fixed alkaline ſalt.

Milk, ſet in a warm place, throws up to the ſurface an unctuous cream, from which, by agitation, the butter is eaſily ſeparated. The addition of alkaline ſalts prevents this ſeparation, not (as ſome have ſuppoſed) by abſorbing an acid from the milk, but by virtue of their property of intimately uniting oily bodies with watery liquors. Sugar, another grand intermedium betwixt oils and water, has this effect in a greater degree, though that concrete is by no means alkaline, or an abſorbent of acids.

The ſweet ſaccharine part of the milk remains diſſolved in the whey after the ſeparation of the curd or cheeſy matter, and may be collected from it in a white cryſtalline form, by boiling the whey till all remains of the curdled ſubſtance have fallen to the bottom; then filtering, evaporating it to a due conſiſtence, ſetting it to ſhoot, and purifying the cryſtals by ſolution in water and a ſecond cryſtallization. Much has been ſaid of the medicinal virtues of this ſugar of milk, but it does not ſeem to have any conſiderable ones: It is from cows milk that it has been generally prepared: and the cryſtals obtained from this kind of milk have but little ſweetneſs.

When milk is ſuffered to coagulate ſpontaneouſly, the whey proves acid, and on ſtanding grows more and more ſo until the putrefactive ſtate commences. Sour whey is uſed as an acid, preferably to the directly vegetable or the mineral acids, in ſome of the chemical arts; as for diſſolving iron in order to the ſtaining of linen and leather. This acid was commonly made uſe of in the bleaching of linen, for diſſolving and extracting the earthy particles left in the cloth by the alkaline ſalts and lime employed for cleanſing and whitening it. Butter-milk is preferred to plain ſour-milk or ſour whey: this laſt is ſuppoſed to give the cloth a yellow colour. Dr Home, in his ingenious treatiſe on this ſubject, recommends water acidulated with ſpirit of vitriol (in the proportion of about half an ounce, or at moſt three quarters of an ounce, to a gallon), as preferable in many reſpects to the acid of milk, or of the more directly vegetable ſubſtances. He obſerves, that the latter are often difficultly procurable, abound with oleaginous particles, and haſten to corruption; whilſt the vitriolic acid is cheap, and pure, and indiſpoſed to putrefy: That milk takes five days to perform its office, whilſt the vitriolic acid does it in as many hours, perhaps in as many minutes: That this acid contributes alſo to whiten the cloth, and does not make it weaker though the cloth be kept in it for months. He finds, that acids as well as alkalies, extract an oily matter from the cloth, and loſe their acidity and alkalicity. Since this treatiſe appeared, the uſe of ſour-milk is very generally ſuperſeded by oil of vitriol.

It is obſervable, that aſſes milk is greatly diſpoſed, on ſtanding for a little time, to become thick and ropy. In the Breſlau collection for the year 1720, there is a remarkable account of milk (which probably was that of the aſs) grown ſo thick and tenacious as to be drawn out into long ſtrings, which, when dried, were quite brittle.

New cows milk, ſuffered to ſtand for ſome days on the leaves of butterwort or ſun-dew, becomes uniformly thick, ſlippery, and coherent, and of an agreeable ſweet taſte, without any ſeparation of its parts. Freſh milk, added to this, is thickened in the ſame manner, and this ſucceſſively. In ſome parts of Sweden, as we are informed in the Swediſh Memoirs, milk is thus prepared for food.

New milk has a degree of glutinous quality, ſo as to be uſed for joining broken ſtone ware. There is a far greater tenacity in cheeſe properly prepared.

Milk, when examined by a microſcope, appears compoſed of numerous globules ſwimming in a tranſparent fluid. It boils in nearly the ſame degree of heat with common water; ſome ſorts rather ſooner, and ſome a little later: after boiling, it is leſs diſ-

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poſed to grow ſour than in its natural ſtate. It is coagulated by acids both mineral and vegetable, and by alkalies both fixed and volatile. The coagulum made by acids falls to the bottom of the ſerum; that made by alkalies ſwims on the ſurface, commonly forming (eſpecially with volatile alkalies) a thick coriaceous ſkin. The ſerum, with alkalies, proves green or ſanious; with acids, it differs little in appearance from the whey that ſeparates ſpontaneoſly. The coagulum formed by acids is diſſolved by alkalies, and that formed by alkalies is rediſſolved by acids; but the milk does not in either caſe reſume its original properties. It is coagulated by moſt of the middle ſalts, whoſe baſis is an earth or a metallic body; as ſolution of alum, fixed ſal ammoniac, ſugar of lead, green and blue vitriol; but not by the chalybeate or purging mineral waters, nor by the bitter ſalt extracted from the purging waters. Among the neutral ſalts that have been tried, there is not one that produces any coagulation. They all dilute the milk, and make it leſs diſpoſed to coagulate with acids or alkalies: Nitre ſeems to have this effect in a greater degree than the other neutral ſalts. It is inſtantly coagulated by highly-rectified ſpirit of wine, but ſcarcely by a phlegmatic ſpirit. It does not mingle with expreſſed oils. All the coagula are diſſolved by gall.

It has generally been ſuppoſed by medical authors, that the milk of animals is of the ſame nature with chyle, and that the human milk always coagulates on the ſtomach of infants; but in a late diſſertation upon the ſubject by Mr Clarke, member of the royal Iriſh academy, we find both theſe poſitions controverted. According to him, woman's milk, in an healthy ſtate, contains no coagulable, mucilaginous, or cheeſy principle, in its compoſition; or it contains ſo little, that it cannot admit of any ſenſible proof. Dr Rutter ſtates, that it does not afford even a ſixth part of the curd which is yielded by cows milk; and Dr Young denies that it is at all coagulable either by rennets or acids. This is confirmed by Dr Ferris, who in 1782 gained the Harveian prize-medal at Edinburgh by a diſſertation upon milk. Mr Clarke informs us, that he has made a vaſt number of experiments upon woman's milk with a view to determine this point. He made uſe of ardent ſpirits, all the different acids, infuſions of infants ſtomachs, and procured the milk of a great many different women; but in no inſtance, excepting one or two, did he perceive any thing like curd. This took place in conſequence of a ſpontaneous aceſcency; and only a ſmall quantity of ſoft flaky matter was formed, which floated in the ſerum. This he looked upon to be a morbid appearance.

Iriſh Tranſ. for 1788.

The general opinion that woman's milk is coagulable, has ariſen from a ſingle circumſtance, *viz.* that infants frequently vomit the milk they ſuck in a ſtate of apparent coagulation. This greatly perplexed Dr Young; who, after having tried in vain to coagulate human milk artificially, concluded, that the proceſs took place ſpontaneouſly in the ſtomach; and that it would always do ſo if the milk were allowed to remain in a degree of heat equal to about 96 degrees of Fahrenheit. Mr Clarke took equal quantities of three different kinds of milk, and put them into bottles ſlightly corked, and theſe bottles into water, the temperature of which was kept up by a ſpirit-of-wine lamp as near as poſſible to 96° of Fahrenheit; and, after frequently examining each bottle during the courſe of the experiment, at the expiration of ſeveral hours there was not the ſmalleſt tendency towards coagulation to be perceived in any of them; the cream was only thrown to the ſurface in a thick and adheſive form, and entirely ſeparated from the fluid below, which had ſomething of a grey and wheyiſh appearance. As the matter vomited by infants is ſometimes more adheſive than we can ſuppoſe cream to be, Mr Clarke ſuppoſed that the curd might be ſo entangled with the cream, as to be with difficulty ſeparated from it; but having collected a quantity of rich cream from the milk of different women, he repeated the experiment with preciſely the ſame event, not being able in any one inſtance to produce the ſmalleſt quantity of curd. To determine, however, what effects might be produced upon milk by the ſtomach of an infant, Mr Clarke made the following experiment: Having taken out the ſtomach of a fœtus which had been deprived of life by the uſe of inſtruments, he infuſed it in a ſmall quantity of hot water, ſo as to make a ſtrong infuſion. He added a tea-ſpoonful of the infuſion to equal quantities of cows and human milk; the conſequence of which was, that the cow's milk was firmly coagulated in a ſhort time, but the human milk was not altered in the leaſt; neither was the leaſt coagulation produced by adding a ſecond and third ſpoonful to the human milk. "Upon the whole, then, (ſays Mr Clarke), I am perſuaded it will be found, that human milk, in an healthy ſtate, contains little or no curd, and that the general opinion of its nature and properties is founded upon fallacious analogy and ſuperficial obſervations made on the matter vomited by infants. We may preſume, that the cream of woman's milk, by its inferior ſpecific gravity, will ſwim on the ſurface of the contents of the ſtomach; and being of an oily nature, that it will be of more difficult digeſtion than any other conſtituent part of milk. When an infant then ſucks very plentifully, ſo as to over-diſtend the ſtomach, or labours under any weakneſs in the powers of digeſtion, it cannot appear unreaſonable to ſuppoſe, that the cream ſhall be firſt rejected by vomiting. Analogous to this, we know that adults affected with dyſpepſia often bring up greaſy fluids from the ſtomach by eructation, and this eſpecially after eating fat meat. We have, in ſome inſtances, known this to blaze when thrown into the fire like ſpirit of wine or oil." Our author derives a confirmation of his opinion from the following obſervation, *viz.* that curds vomited by infants of a few days old are yellow, while they become white in a fortnight or three weeks. This he accounts for from the yellow colour of the cream thrown up by the milk of women during the firſt four or five days after delivery.

Mr Clarke likewiſe controverts that common opinion of the human milk being ſo prone to acidity; that a great number of the diſeaſes of children are to be accounted for from that principle. "Whoever (ſays he) takes the trouble of attentively comparing human milk with that of ruminant animals, will ſoon find it to be much leſs prone to run into the aceſcent or acid proceſs. I have very often expoſed equal quantities of human and cows milk in degrees of temperature, varying from the common ſummer heat, or 65° to 100°; and

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and I have conſtantly found that cows milk acquires a greater degree of acidity in 36 hours than the human did in many days: cows milk becomes offenſively putrid in four or five days; a change which healthy human milk, expoſed in the ſame manner, will not undergo in many weeks, nay ſometimes in many months. I once kept a few ounces of a nurſe's milk, delivered about ſix or ſeven days, for more than two years in a bottle moderately corked. It ſtood on the chimney-piece, and was frequently opened to be examined. At the end of this period it ſhowed evident marks of moderate acidity, whether examined by the taſte, ſmell, or paper ſtained by vegetable blues or purples; the latter it changed to a florid red colour, whereas cows milk kept a few days changed the colour of the ſame paper to a green, thereby clearly ſhowing its putreſcent tendency."

Our author next goes on to conſider of the probability there is of milk becoming ſo frequently and ſtrongly acid as to occaſion moſt of the diſeaſes of infants. He begins with an attempt to ſhow, that the phenomena commonly looked upon to be indications of acrimony are by no means certain. Curdled milk has already been ſhown to be no ſign of acidity; and the other appearance, which has commonly been thought to be ſo certain, *viz.* green fæces, is, in the opinion of Mr Clarke, equally fallacious. In ſupport of this he quotes a letter from Dr Sydenham to Dr Cole; in which he ſays that the green matter vomited by hyſterical women is not any proof of acrid humours being the cauſe of that diſeaſe, for ſea-ſick people do the ſame. The opinion of green fæces being an effect of acidity, proceeds on the ſuppoſition that a mixture of bile with an acid produces a green colour; but it is found, that the vegetable acid, which only can exiſt in the human body, is unable to produce this change of colour, though it can be effected by the ſtrong mineral acids. As nothing equivalent to any of theſe acids can be ſuppoſed to exiſt in the bowels of infants, we muſt therefore take ſome other method of accounting for the green fæces frequently evacuated by them. "Why ſhould ſour milk, granting its exiſtence, give riſe to them in infants and not in adults? Have butter milk, ſummer-fruits of the moſt aceſcent kind, lemon or orange juice, always this effect in adults by their admixture with bile? This is a queſtion which, I believe, cannot be anſwered in the affirmative."

On the whole, Dr Clarke conſiders the diſeaſe of acidity in the bowels, though ſo frequently mentioned, to be by no means common. He owns, indeed, that it may ſometimes occur in infancy as well as in adults, from weakneſs of the ſtomach, coſtiveneſs, or improper food; and an indubitable evidence is afforded by fæces which ſtain the blue or purple colour of vegetables to a red, though nothing can be inferred with certainty from the colour or ſmell.

The Doctor next proceeds to ſtate ſeveral reaſons for his opinion, that the greater number of infantile diſeaſes are not owing to acidity: 1. Woman's milk in an healthy ſtate contains little or no coagulable matter or curd. 2. It ſhows leſs tendency out of the body to become aceſcent than many other kinds of milk. 3. The appearances which have been generally ſuppoſed to characteriſe its acidity do not afford ſatisfactory evidence of ſuch a morbid cauſe. 4. Granting this to be the caſe, we have plenty of mild abſorbents, capable of deſtroying all the acid which can be ſuppoſed to be generated in the bowels of an infant; yet many children are obſerved to die in conſequence of theſe diſeaſes ſuppoſed to ariſe from acidity. 5. Tho' the milk of all ruminant animals is of a much more aceſcent nature than that of the human ſpecies, yet the young of theſe animals never diſcover any thing like the diſeaſes attributed to acidity in infants. 6. Hiſtory informs us, that whole nations uſe ſour curdled milk as a conſiderable part of their food without feeling any inconvenience; which, however, muſt have been the caſe, if acidity in the ſtomach were productive of ſuch deleterious effects as has been ſuppoſed.

The reaſoning of Dr Clarke ſeems here to be very plauſible, and nothing has as yet been offered to contradict it. The reviewers in taking notice of the treatiſe only obſerve, that the Doctor's poſitions are ſupported by great probability; yet "they have ſeen them, or think they have ſeen them, contradicted by the appearance of diſeaſes and the effects of medicines;" ſo that they muſt leave the ſubject to farther examination.

In a memoir by Meſſrs Parmentier and Deyeux, members of the royal college of pharmacy, &c. in Paris, we have a great number of experiments on the milk of aſſes, cows, goats, ſheep, and mares, as well as women. The experiments on cows milk were made with a view to determine whether any change was made in the milk by the different kinds of food eaten by the animal. For this purpoſe ſome were fed with the leaves of *mais* or Turkey wheat; ſome with cabbage; others with ſmall potatoes; and others with common graſs. The milk of thoſe fed with the *mais* or Turkey wheat was extremely ſweet; that from the potatoes and common graſs much more ſerous and inſipid; and that from the cabbages the moſt diſagreeable of all. By diſtillation only eight ounces of a colourleſs fluid were obtained from as many pounds of each of theſe milks; which from thoſe who fed upon graſs had an aromatic flavour; a diſagreeable one from cabbage; and none at all from the potatoes and Turkey wheat. This liquid became fetid in the ſpace of a month whatever ſubſtance the animal had been fed with, acquiring at the ſame time a viſcidity and becoming turbid; that from cabbage generally, but not always, becoming firſt putrid. All of them ſeparated a filamentous matter, and became clear on being expoſed to the heat of 25° of Reamur's thermometer. In the reſiduums of the diſtillations no difference whatever could be perceived. As the only difference therefore exiſting in cow's milk lies in the volatile part, our authors conclude, that it is improper to boil milk either for common or medicinal purpoſes. They obſerved alſo, that any ſudden change of food, even from a worſe to a better kind, was attended by a very remarkable diminution in the quantity of milk. All the reſiduums of the diſtillations yielded, in a ſtrong fire, a yellow oil, an acid, a thick and black empyreumatic oil, a volatile alkali, and towards the end a quantity of inflammable air, and at laſt a coal remained containing ſome fixed alkali with muriatic acid.

On agitating, in long bottles, the creams from the milk of cows fed with different ſubſtances, all of them were formed into a kind of half-made butter; of which that formed from the milk from mais was white, firm, and inſipid; that from potatoes was ſofter and more pinguedinous: but that from common graſs was the beſt of all. Cabbage, as in other caſes, gave a ſtrong taſte.

In the courſe of their experiments, it was endeavoured to determine whether butter is actually contained in the cream, or whether it be a chemical production of the operation of churning. They could not find any reaſon abſolutely ſatisfactory on either ſide, but incline to the latter opinion; becauſe when cream is allowed to remain among the milk, and the whole curdled promiſcuouſly, only fat cheeſe, without any butter, is produced. The oily parts cannot be ſeparated into butter either by acids or any other means than churning: even the artificial mixture of oil with the cream is inſufficient for the purpoſe.

The ſerum of milk was reduced by filtration to a clear and pellucid liquor; and, by mixture with fixed alkali, depoſited a portion of cheeſy matter which had been diſſolved in the whey. The ſugar of milk was alſo found in this liquor.

In their experiments upon the milk of various animals, it was found that the milk of aſſes yielded by diſtillation an inſipid liquor, and depoſited a liquor ſimilar to the lymph of cows milk. It is coagulated by all the acids, but not into an uniform maſs, exhibiting only the appearance of diſtinct flocculi. It affords but little cream, which is converted with difficulty into a ſoft butter that ſoon becomes rancid. It has but a ſmall quantity of ſaccharine particles, and theſe are often mixed with muriatic ſelenite and common ſalt. Goats milk has a thick cream, and agreeable to the taſte; and the milk itſelf may be preſerved longer in a ſound ſtate than any other ſpecies, the ſcum on its ſurface being naturally convertible into palatable cheeſe. It is eaſily made into firm butter, which does not ſoon become rancid, and has a good flavour. The butter-milk contains a large quantity of cheeſy matter which readily coagulates; but has ſtill leſs ſaccharine matter than that of aſſes. Sheeps milk can ſcarce be diſtinguiſhed from that of a cow, and eaſily parts with its cream by ſtanding. It is of a yellow colour, an agreeable flavour, and yields a great proportion of butter; but this is not ſolid, and ſoon becomes rancid. Mare's milk is the moſt inſipid and leaſt nutritious of any; notwithſtanding which it has been much recommended for weak and conſumptive patients: in which caſes it is probable that it proves efficacious by being more conſonant than any other to the debilitated powers of digeſtion It boils with a ſmaller fire than any other kind of milk, is eaſily coagulated, and the diſtilled water does not ſoon change its nature. It has but a ſmall quantity of cheeſy matter, and very few oily particles: the cream cannot be made into butter; and the whey contains about as much ſugar as cows or goats milk.

In this memoir our authors remark, that in order to augment the quantity, as well as to improve the quality, of the milk of animals, they ſhould be well fed, their ſtalls kept clean, and their litter frequently renewed: they ſhould be milked at ſtated hours, but not drained: great attention ſhould alſo be paid to the breed; becauſe inferior cattle are maintained at as great expence as the moſt valuable kinds. No change ought to be made in the food; though if the milk be employed for medicinal purpoſes, it may be improved by a proper mixture of herbs, &c.

In their experiments on woman's milk, Meſſrs Parmentier and Deyeux differ ſomewhat from Dr Clarke. They firſt tried the milk of a woman who had been delivered four months; and obſerved, that after the cream had been ſeparated the other part appeared of a more perfect white, and that it could not be coagulated either by vinegar or mineral acids; which they attributed to a ſuperabundance of ſerum. But they found that in proportion to the age of the milk it was found to be more eaſily coagulable; and this was confirmed by experiments made upon the milk of 20 nurſes. Its coagulability was not increaſed by heat. The cream, by agitation, formed a viſcid unctuous matter, but could not be changed into perfect butter: but they found that it was extremely difficult to determine the proportions of the various component parts in human milk, as it differs remarkably, not only in different ſubjects, but in the ſame ſubject at different times. In a nurſe aged about 32 years, who was extremely ſubject to nervous affections, the milk was one day found almoſt quite colourleſs and tranſparent. In two hours after, a ſecond quantity drawn from the breaſt was viſcid like the white of an egg. It became whiter in a ſhort time, but did not recover its natural colour before the evening It was afterwards found that theſe changes were occaſioned by her having ſome violent hyſteric fits in the mean time.

Sugar of Milk. Under the article CHEMISTRY an account has been given of the ſugar of milk, with ſome of the different methods of making it: but of late we have an account of a method uſed by ſome of the Tartar nations of preſerving their milk by means of froſt; in which operation great quantities of the ſugar of milk are accidentally formed. The account was given by Mr Fahrig of Peterſburgh, who undertook a journey, by order of the academy of Peterſburgh, among the Mogul tribes who inhabit the country beyond the lake Baikal, on the Banks of the river Salenga. Theſe people allow their milk to freeze in large quantity in iron kettles; and, when it is perfectly congealed, they place them over a gentle fire to ſoften the edges of the cake, after which it may be taken out with a wooden ſpatula. They commence theſe operations at the beginning of the cold, when they have milk in the greateſt abundance; after which it may be preſerved with great eaſe throughout the whole winter. Mr Fahrig having frequent opportunities of ſeeing theſe cakes, ſoon obſerved, that the ſurface of them was covered to a conſiderable depth with a farinaceous powder; and having eſtabliſhed a dairy upon the ſame plan with thoſe of the Moguls, he found the ſame thing take place with himſelf. This powder was extremely ſweet, and he received platefuls of it from the natives, who uſed it in their food, and ſweetened their other victuals with it Having cauſed a number of cakes of frozen milk to be conveyed to the top of his houſe, where they were directly expoſed to the violent cold, he found that the ſeparation of the ſaccharine powder was greatly promoted by this means. He ſcraped the cakes every week to the depth of two inches, and afterwards ſpread out the powder upon an earthen plate in order to deſtroy the remains of moiſture which might have prevented it from keeping for any length of time. When expoſed in this manner it had a very agreeable and ſtrong ſaccharine taſte; diſſolved in warm water; and when ſtrongly ſtirred by means of a chocolate-ſtick, would at all times produce an excellent and well-taſted milk. Raw milk affords a much larger quantity of this ſaccharine matter than ſuch as has been boiled, or which has had the cream taken off it. Neither muſt the milk be ſuddenly expoſed to the cold before it has loſt its natural heat; for the ſudden contact of the cold drives all the cheeſy and fat part towards the middle, while the external parts conſiſt of little elſe than water. In order to allow the parts of the milk to be all properly mixed together, Mr Fahrig allowed the milk when newly taken from the cows to cool, and then poured it out into ſhallow kettles.

Our author is of opinion that this method of making milk would be of great ſervice to navigators to ſupply themſelves with milk during long ſea voyages: and he aſſures us, from his own experience, that it will always ſucceed, if proper attention be paid to it. He is of opinion, however that all countries are not equally proper for the preparation of this ſaccharine matter: and indeed this ſeems very evidently to be the caſe, as the proceſs appears to be a cryſtallization of the ſaccharine parts of the milk, and the ſeparation of them from the aqueous ones by means of extreme cold. The country in which he made the experiments is one of the moſt elevated in all Aſia; and ſo cold, that, though it lies only in the 50th degree of north latitude, its rivers are frozen up for ſix months of the year. A very dry cold wind alſo prevails throughout almoſt the whole year; and the dry winds generally come from the north, being almoſt always preceded by a warm wind from the ſouth, which blows for ſome time. The dry rarefied air increaſes the evaporation from the ice-cakes, and leaves nothing but the ſaccharine or pure conſtituent parts of the milk, which with the addition of water can always recompoſe the fluid.

Milk, in the wine-trade. The coopers know very well the uſe of ſkimmed milk, which makes an innocent and efficacious forcing for the fining down of all white wines, arracks, and ſmall ſpirits; but is by no means to be uſed for red wines, becauſe it diſcharges their colour. Thus, if a few quarts of well ſkimmed milk be put to a hogſhead of red-wine, it will ſoon precipitate the greater part of the colour, and leave the whole nearly white; and this is of known uſe in the turning red wines, when pricked, into white; in which a ſmall degree of acidity is not ſo much perceived.

Milk is, from this quality of diſcharging colour from wines, of uſe alſo to the wine-coopers, for the whitening of wines that have acquired a brown colour from the caſk, or from having been haſtily boiled before fermenting; for the addition of a little ſkimmed milk, in theſe caſes, precipitates the brown colour, and leaves the wines almoſt limpid, or of what they call a *water whiteneſs*, which is much coveted abroad in wines as well as in brandies.

Milk of Lime; Milk of Sulphur. The name of *milk* is given to ſubſtances very different from *milk* properly ſo called, and which reſemble milk only in colour. Such is water in which quicklime has been ſlaked, which acquires a whiteneſs from the ſmall particles of the lime being ſuſpended in it, and has hence been called the milk of *lime*. Such alſo is the ſolution of liver of *ſulphur*, when an acid is mixed with it, by which white particles of ſulphur are made to float in the liquor.

Milk of Vegetables. For the ſame reaſon that milk of animals may be conſidered as a true animal emulſion, the emulſive liquors of vegetables may be called *vegetable milks*. Accordingly emulſions made with almonds are commonly called *milk of almonds*. But beſides this vegetable milk, which is in ſome meaſure artificial, many plants and trees contain naturally a large quantity of emulſive or milky juices. Such are lettuce, ſpurge, fig-tree, and the tree which furniſhes the elaſtic American reſin. The milky juices obtained from all theſe vegetables derive their whiteneſs from an oily matter, mixed and undiſſolved in a watery or mucilaginous liquor. Moſt reſinous gums were originally ſuch milky juices, which afterwards become ſolid by the evaporation of their moſt fluid and volatile parts.

Theſe natural milky juices have not been examined by any chemiſt. Such an examination would, however, procure much eſſential knowledge concerning vegetable œconomy. We ſhould probably find examples of all kinds of oils reduced into milky juices; and this knowledge cannot fail of throwing much light on the nature of reſins and gum-reſins.

Milk-Fever. See Midwifery, p. 806.

Milky-Hedge, the Engliſh name of a ſhrub growing on the coaſt of Coromandel, where it is uſed for hedging. The whole ſhrub grows very buſhy with numerous erect branches, which are compoſed of cylindrical joints as thick as a tobacco-pipe, of a green colour, and from three to ſix inches long: the joints are thicker than the other parts, but always give way firſt on any accidental violence offered to the plant. When broken it yields a milk of an exceſſively cauſtic quality, which bliſters any part of the ſkin it touches. When the joints are broken off at each end, the tube then contains but very little milk. In this ſtate Mr Ives ventured to touch it with his tongue, and found it a little ſweet. In the hedges it is ſeldom very woody; but when it is, the wood is pretty ſolid, and the bark grey and cracked. This plant, he informs us, has acquired a great reputation in curing the venereal diſeaſe, on the following account. A poor Portugueſe woman, the oldeſt female of her family, had wrought ſurpriſing cures in the moſt inveterate venereal diſorders, even ſuch as the European phyſicians had pronounced incurable. Theſe facts became ſo notorious, that the ſervants of the company, and eſpecially their ſurgeons, were induced to offer her a very conſiderable premium for a diſcovery of the medicine; but ſhe always refuſed to comply, giving for a reaſon, that while it remained a ſecret, it was certain proviſion for the maintenance of the family in the preſent as well as in future generations. On account of this denial the Engliſh ſurgeons were ſometimes at the pains to have her motions without doors carefully watched; and as they were not able to diſcover that ſhe ever gathered of any other plant or tree but this, they conjectured that the milk of this tree was the ſpecific employed. Mr Ives inquired at the black doctors concerning the virtues of this plant; who all agreed, that it will cure the lues venera, but differed as to the manner of adminiſtering it; ſome ſaying that a joint of it ſhould be eaten every morning; others that the milk only ſhould be dropped upon ſugar; and then put into milk, oil, &c. and given daily to the patient.

Milky-Way. See Astronomy-*Index*.

MILL, a machine for grinding corn, &c. of which there are various kinds, according to the different methods of applying the moving power; as water-mills, wind-mills, mills worked by horſes, &c. See Mechanics, Sect. V.

The firſt obvious method of reducing corn into flour for bread would be, by the ſimple expedient of pounding. And that was for ages the only one which was practiſed by the various deſcendants of Adam, and actually continued in uſe among the Romans below the reign of Vaſpaſian. But the proceſs was very early improved by the application of a grinding power, and the introduction of mill-ſtones. This, like moſt of the common refinements in domeſtic life, was probably the invention of the antediluvian world, and certainly practiſed in ſome of the earlieſt ages after it. And, like moſt of them, it was equally known in the eaſt and weſt. Hence the Gauls and Britons appear familiarly acquainted with the uſe of hand-mills before the time of their ſubmiſſion to the Romans; the Britons particularly diſtinguiſhing them, as the Highlanders and we diſtinguiſh them at preſent, by the ſimple appellations of *querns*, *carnes*, or *ſtones*. And to theſe the Romans added the very uſeful invention of water-mills. For this diſcovery the world is pretty certainly indebted to the genius of Italy; and the machine was not uncommon in the country at the conqueſt of Lancaſhire. This, therefore, the Romans would neceſſarily introduce with their many other refinements among us. And that they actually did, the Britiſh appellation of a *water-mill* fully ſuggeſts of itſelf; the *melin* of the Welſh and Corniſh, the *mull*, *meill*, and *melin* of the Armoricans, and the Iriſh *muilean* and *muilind*, being all evidently derived from the Roman *mola* and *molendinum*. The ſubject Britons univerſally adopted the Roman name, but applied it, as we their ſucceſſors do, only to the Roman *mill*; and one of theſe was probably erected at every ſtationary city in the kingdom. One plainly was at Mancheſter, ſerving equally the purpoſes of the town and the accommodation of the garriſon. And one alone would be ſufficient, as the uſe of handmills remained very common in both, many having been found about the ſite of the ſtation particularly; and the general practice having deſcended among us nearly to the preſent period. Such it would be peculiarly neceſſary to have in the camp, that the garriſon might be provided againſt a ſiege. And the water-mill at Mancheſter was fixed immediately below the Caſtlefield and the town, and on the channel of the Medlock. There, a little above the ancient ford, the ſluice of it was accidentally diſcovered about 30 years ago. On the margin of Dyer's-croft, and oppoſite to ſome new conſtructions, the current of the river, accidentally ſwelled with the rains, and, obſtructed by a dam, broke down the northern bank, ſwept away a large oak upon the edge of it, and diſcloſed a long tunnel in the rock below. This has been ſince laid open in part with a ſpade. It appeared entirely uncovered at the top, was about a yard in width, and another in depth, but gradually narrowed to the bottom. The ſides ſhewed every where the marks of the tool on the rock, and the courſe of it was parallel with the channel. It was bared by the flood about 25 yards only in length, but was evidently continued for ſeveral farther; having originally begun, as the nature of the ground evinces, juſt above the large curve in the channel of the Medlock.

Whitaker's Hiſtory of Mancheſter.

For the firſt five or ſix centuries of the Roman ſtate, there were no public bread-bakers in the city of Rome. They were firſt introduced into it from the eaſt, at the concluſion of the war with Perſeus, and about the year 167 before Chriſt. And, towards the cloſe of the firſt century, the Roman families were ſupplied by them every morning with freſh loaves for breakfaſt. But the ſame cuſtom, which prevailed originally among the Romans and many other nations, has continued nearly to the preſent time among the Mancunians. The providing of bread for every family was left entirely to the attention of the women in it. And it was baked upon ſtones, which the Welſh denominate *greidiols* and we *gredles*. It appears, however, from the kiln-burnt pottery which has been diſcovered in the Britiſh ſepulchres, and from the Britiſh appellation of an *odyn* or *oven* remaining among us at preſent, that furnaces for baking were generally known among the original Britons. An odyn would, therefore, be erected at the manſion of each Britiſh baron, for the uſe of himſelf and his retainers. And, when he and they removed into the vicinity of a Roman ſtation, the oven would be rebuilt with the manſion, and the public bakehouſes of our towns commence at the firſt foundation of them. One bakehouſe would be conſtructed, as we have previouſly ſhown one mill to have been ſet up, for the public ſervice of all the Mancunian families. One oven and one mill appear to have been equally eſtabliſhed in the town. And the inhabitants of it appear immemorially accuſtomed to bake at the one and grind at the other. Both, therefore, were in all probability conſtructed at the firſt introduction of water-mills and ovens into the country. The great ſimilarity of the appointments refers the conſideration directly to one and the ſame origin for them. And the general nature of all ſuch inſtitutions points immediately to the firſt and actual introduction of both. And, as the ſame eſtabliſhments prevailed equally in other parts of the north, and pretty certainly obtained over all the extent of Roman Britain, the ſame erections were as certainly made at every ſtationary town in the kingdom.

MILL (John), a very learned divine, was born at Shap in Weſtmoreland, about the year 1645; and became a ſervitor of Queen's college Oxford. On his entering into orders he became an eminent preacher, and was made prebendary of Exeter. In 1681, he was created doctor of divinity; about the ſame time he was made chaplain in ordinary to King Charles II. and in 1685 he was elected principal of St Edmund's hall in Oxford. His edition of the Greek Teſtament, which will ever render his name memorable, was publiſhed about a fortnight before his death, which happened

pened in June 1707. Dr Mills was employed 30 years in preparing this edition.

MILL-STONE, the ſtone by which corn is ground. —The mill-ſtones which we find preſerved from ancient times are all ſmall, and very different from thoſe in uſe at preſent. Thoreſby mentions two or three ſuch found in England, among other Roman antiquities, which were but 20 inches broad; and there is great reaſon to believe that the Romans as well as the Egyptians of old, and the ancient Jews, did not employ horſes, or wind, or water, as we do, to turn their mills, but made their ſlaves and captives of war do this laborious work: they were in this ſervice placed behind theſe mill-ſtones, and puſhed them on with all their force. Sampſon, when a priſoner to the Philiſtines, was treated no better, but was condemned to the mill-ſtone in his priſon. The runner or looſe mill-ſtone, in this ſort of grinding, was uſually very heavy for its ſize, being as thick as broad. This is the mill-ſtone which is expreſsly prohibited in ſcripture to take in pledge, as lying looſe it was more eaſily removed. The Talmudiſts have a ſtory, that the Chaldeans made the young men of the captivity carry mill-ſtones with them to Babylon, where there ſeems to have been a ſcarcity at that time; and hence, probably, their paraphraſe renders the text "have borne the mills, or mill-ſtones;" which might thus be true in a literal ſenſe. They have alſo a proverbial expreſſion of a man with a mill-ſtone about his neck; which they uſe to expreſs a man under the ſevereſt weight of affliction. This alſo plainly refers to this ſmall ſort of ſtones.

Rheniſh MILL-STONE, is claſſed by Cronſtedt among the volcanic products, on account of its appearance, which is a blackiſh grey, porous, and perfectly reſembling a lava of Mount Veſuvius.

MILLENARIANS, or CHILIASTS, a name given to thoſe, in the primitive ages, who believed that the ſaints will reign on earth with Chriſt 1000 years. See MILLENIUM.

MILLENER, or MILLINER, one who ſells ribbands and dreſſes, particularly head-dreſſes, for women; and who makes up thoſe dreſſes.

Of this word different etymologies have been given. It is not derived from the French; for, through ſome ſtrange fatality, the French cannot expreſs the notion of *millener*, otherwiſe than by the circumlocution *marchand* or *marchande des modes*.

Neither is it derived from the Low-Dutch language, the great, but neglected, magazine of the Anglo-Saxon. For Sewell, in his Dictionary Engliſh and Dutch, 1708, deſcribes *milliner* to be "en kraamer van lint en andere optoniſelon, Franſche kraamer;" that is "a pedlar who ſells ribbons and other trimmings or ornaments; a French pedlar."

Littleton, in his Engliſh and Latin dictionary, publiſhed 1677, defines millener, "a jack of all trades;" q. d. *millenarius*, or *mille mercium venditor;* that is, "one who ſells a thouſand different ſorts of things," This etymology ſeems fanciful: But, if he rightly underſtood the vulgar meaning of the word *millener* in his time, we muſt hold that it then implied what is now termed "a haberdaſher of ſmall wares," one who dealt in various articles of petty merchandiſe, and who did not *make up* the goods which he ſold.

Before Littleton's time, however, a ſomewhat nicer characteriſtic than ſeems compatible with his notion, appears to have belonged to them; for Shakeſpeare, in his Henry IV. makes Hotſpur, when complaining of the daintineſs of a courtier, ſay,

"He was *perfumed* like a millener."

The fact ſeems to be, that there were milleners of ſeveral kinds: as *horſe-milleners*, (for ſo thoſe perſons were called who made ornaments of coloured worſted for horſes); haberdaſhers of ſmall wares, the *milleners* of Littleton; and *milleners* ſuch as thoſe now peculiarly known by that name, whether male or female, and to whom Shakeſpear's alluſion ſeems moſt appropriate.

Laſtly, Dr Johnſon, in his Dictionary, derives the word from *milaner*, an inhabitant of *Milan*, from whence people of this profeſſion firſt came, as a *Lombard* is a banker.

MILLE PASSUS, or *Millia Paſſuum;* a very common expreſſion among the ancient Romans for a meaſure of diſtance, commonly called a *mile*. *Milliarium*, rarely uſed. Which Heſychius made to conſiſt of ſeven ſtadia; Plutarch, little ſhort of eight; but many others, as Strabo and Polybius, make it juſt eight ſtadia. The reaſon of this difference ſeems to be, that the former had a regard to the Grecian foot, which is greater than the Roman or Italic. This diſtance is oftentimes called *lapis*, which ſee. Each paſſus conſiſted of five feet, (Collumella).

MILLENIUM, "a thouſand years;" generally employed to denote the thouſand years, during which, according to an ancient tradition in the church, grounded on ſome texts in the Apocalypſe and other ſcriptures, our bleſſed Saviour ſhall reign with the faithful upon earth after the firſt reſurrection, before the final completion of beatitude.

Though there has been no age of the church in which the millenium was not admitted by individual divines of the firſt eminence, it is yet evident from the writings of Euſebius, Irenæus, Origen, and others among the ancients, as well as from the hiſtories of Dupin, Moſheim, and all the moderns, that it was never adopted by the whole church, or made an article of the eſtabliſhed creed in any nation.

About the middle of the fourth century the millenians held the following tenets:

1ſt, That the city of Jeruſalem ſhould be rebuilt, and that the land of Judea ſhould be the habitation of thoſe who were to reign on earth 1000 years.

2dly, That the firſt reſurrection was not to be confined to the martyrs; but that after the fall of Antichriſt all the juſt were to riſe, and all that were on the earth were to continue for that ſpace of time.

3dly, That Chriſt ſhall then come down from heaven, and be ſeen on earth, and reign there with his ſervants.

4thly, That the ſaints during this period ſhall enjoy all the delights of a terreſtrial paradiſe.

Theſe opinions were founded upon ſeveral paſſages of ſcripture, which the millenarians among the fathers underſtood in no other than a literal ſenſe, but which the moderns, who hold that opinion, conſider as partly literal and partly metaphorical. Of theſe paſſages, that upon which the greateſt ſtreſs has been laid, we believe to be the following:—"And I ſaw an angel come down from heaven, having the key of the bottomleſs pit, and a great chain in his hand. And he laid hold on the dragon, that old ſerpent, which is the devil and Satan, and bound him a *thouſand years*, and caſt him into the bottomleſs pit, and ſhut him up, and ſet a ſeal upon him, that he ſhould deceive the nations no more till *the thouſand years* ſhould be fulfilled: and after that he muſt be looſed a little ſeaſon. And I ſaw thrones, and they ſat upon them, and judgment was given unto them: and I ſaw the ſouls of them that were beheaded for the witneſs of Jeſus, and for the word of God, and which had not worſhipped the beaſt, neither his image, neither had received his mark upon their foreheads, or in their hands; and they lived and reigned with Chriſt a *thouſand years*. But the reſt of the dead lived not again till *the thouſand years were finiſhed*. This is the firſt reſurrection [*]." This paſſage all the ancient millenarians took in a ſenſe groſsly literal; and taught, that during the millenium the ſaints on earth were to enjoy every bodily delight. The moderns, on the other hand, conſider the power and pleaſure of this kingdom as wholly ſpiritual; and they repreſent them as not to commence till after the conflagration of the preſent earth. But that this laſt ſuppoſition is a miſtake, the very next verſe except one aſſures us: for we are there told, that "when the thouſand years are expired, Satan ſhall be looſed out of his priſon, and ſhall go out to deceive the nations which are in the four quarters of *the earth*;" and we have no reaſon to believe that he will have ſuch power or ſuch liberty in "the new heavens and the *new earth*, wherein dwelleth righteouſneſs."

For this and other reaſons, which our limits will not permit us to enumerate, many judicious critics contend, that the prophecies of the millenium point, not to a reſurrection of martyrs and other juſt men to reign with Chriſt a thouſand years in a viſible kingdom upon earth, but to that ſtate of the Chriſtian church, which, for a thouſand years before the general judgment, will be ſo pure and ſo widely extended, that when compared with the ſtate of the world in the ages preceding, it may, in the language of ſcripture be called a reſurrection from the dead. In ſupport of this interpretation they quote two paſſages from St Paul, in which a converſion from Paganiſm to Chriſtianity, and a reformation of life, is called a reſurrection from the dead:—"Neither yield ye your members as inſtruments of unrighteouſneſs unto ſin; but yield yourſelves unto God as thoſe that are *alive from the dead* [§]:" And again "Wherefore he ſaith, Awake thou that ſleepeſt, and *ariſe from the dead*, and Chriſt ſhall give thee light [‡]." It is likewiſe to be obſerved, that in all the deſcriptions of the reſurrection and future judgment which are given us at ſuch length in the goſpels and epiſtles, there is no mention made of a *firſt* and *ſecond* reſurrection at the diſtance of a thouſand years from each other. There is indeed an order in the reſurrection: for we are told [†], that "every man ſhall riſe in his own order; Chriſt the firſt fruits, afterwards they that are Chriſt's at his coming, &c." But were the millenarian hypotheſis well founded, ſay its oppoſers, the words ſhould rather have run thus: "Chriſt the firſt fruits, then the martyrs at his coming, and a thouſand years afterwards the reſidue of mankind. Then cometh the end, &c."

Theſe arguments incline many to believe, that by the reign of Chriſt and the ſaints for a thouſand years upon earth, nothing more is meant, than that before the general judgment the Jews ſhall be converted, genuine Chriſtianity be diffuſed through all nations, and mankind enjoy that peace and happineſs which the faith and precepts of the goſpel are calculated to confer on all by whom they are ſincerely embraced.

Our Saviour's own account of his religion is, that from a ſmall beginning it will increaſe to the full harveſt. The millenium therefore is to be conſidered as the full effect of the Chriſtian principles in the hearts of men, and over the whole world; and the divines who have treated of this ſubject endeavour to prove, that this is to be expected from the facts which have already exiſted, and from the importance of the Chriſtian doctrine.

1. The gradual progreſs of Chriſtianity is no objection to this fact. This is ſimilar to the progreſs and advancement from leſs to greater perfection in every thing which poſſeſſes vegetable or animal life. The ſame thing is obſerved in the arts, in civilization, in ſocieties, and in individuals—and why ſhould it not be admitted to have place in religion? There is indeed a general principle on which a gradual progreſſion, both in the natural and moral world, is founded. The Almighty never employs ſupernatural means where the thing can be accompliſhed by thoſe which are natural. This idea is of the moſt general extent through the whole of the preſent ſyſtem of nature. The poſſibility of another plan could eaſily be admitted; but in this caſe there would be a total alteration of every part of the works of God or of man that we are acquainted with. In the ſame manner, if the religion of Chriſt had been irreſiſtible, it would have totally altered its natural conſequences. It was neceſſary, therefore, from the preſent condition of man as an active, intelligent, and accountable being, that means ſhould be employed; and wherever means are employed, the effects produced muſt be gradual, and not inſtantaneous.

2. Though the progreſs of a divine revelation be gradual yet it is to be expected, from the wiſdom and compaſſion of God, that it ſtill will be advancing in the hearts of men, and over the world. In the firſt age of the church, the word of God, ſupported by miracles, and by the animated zeal of men, who ſpake what they ſaw and heard, grew and prevailed. In this caſe ſupernatural means were neceſſary, becauſe the prejudices of the world could not be ſubdued without them. It was the firſt watering of a plant which you afterwards leave to the dew of heaven. Miracles at the ſame time were employed only as the means of conviction; and they were not continued, becauſe in this caſe they would have become a conſtant and irreſiſtible principle, incompatible with the condition of man as a reaſonable agent. After this power was withdrawn, there were many ages of ignorance and ſuperſtition in the Chriſtian church. But what is neceſſary to be eſtabliſhed on this ſubject is, not that the progreſs of Chriſtianity has never been interrupted, but that on the whole it has been advancing. The effects of this religion on mankind, in proportion as it was received, were immediate and viſible:

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[*] Rev. xx. 1--6.

[§] Rom. vi. 13.

[‡] Eph. v. 14.

[†] 1 Cor. xv. 23.

ſible; It deſtroyed the groſs ſuperſtition of idol-worſhip: it aboliſhed the practice, which was general in the heathen world, of reducing to the loweſt ſtate of ſervitude the greateſt part of our brethren: it ſoftened the horrors of war even when the vices of mankind made defence neceſſary: it entered into ſocial and private life; and taught men benevolence, humanity, and mercy. It is in theſe bleſſed effects that we can obſerve the progreſs of Chriſtianity even to this day. Superſtition and idolatry were ſoon engrafted on the ſtem which our Saviour planted in the world; but the ſimplicity of the goſpel has been gradually undermining the fabric of ſuperſtition; and the men who are moſt nearly intereſted in the deceit are now almoſt aſhamed to ſhow their faces in the cauſe. The practice of ſlavery has, generally ſpeaking, been extinguiſhed in the Chriſtian world: yet the remains of it have been a diſgrace to the Chriſtian name, and the profeſſors of that religion have now begun to ſee the inconſiſtency. War is not only carried on with leſs animoſity, and leſs havoc of the human ſpecies; but men begin to cultivate more generally, and to delight in, the arts of peace. The increaſing ſpirit of charity and benevolence, of which it were eaſy to give unexampled inſtances in the preſent age, is a decided proof of the increaſing influence of Chriſtianity. At the ſame time, if, inſtead of theſe general principles, we were to deſcend to private examples of infidelity or of wickedneſs, it would be eaſy to bring proofs in ſupport of an oppoſite opinion: but the reaſoning would by no means be equally concluſive; for if the general principles by which ſociety is regulated be more liberal and merciful, it is evident that there is more goodneſs in a greater number of the human race. Society is nothing more than a collection of individuals; and the general tone, eſpecially when it is on the ſide of virtue, which almoſt in every inſtance oppoſes the deſigns of leading and intereſted men, is a certain evidence of the private ſpirit. To ſhow that this reformation is connected with Chriſtianity, it is unneceſſary to ſtate any compariſon between the influence of heathen and the influence of Chriſtian principles; between civilization as depending on the powers of the human underſtanding, and on the efficacy of the word of God. The whole of this controverſy may be appealed to an obvious fact, viz. that as any nation has come nearer to the ſimplicity of the goſpel in the ſtandard of its worſhip, it has been more poſſeſſed of thoſe national virtues which we have aſcribed to the influence of Chriſtianity. This fact is worth a thouſand volumes of ſpeculation on this ſubject.

3. A revelation ſanctioned by God, for a benevolent purpoſe, will be expected to produce effects correſponding to the wiſdom which gave it, and to the purpoſe for which it is employed. It may be gradual: but it will be increaſing, and it muſt increaſe, to the full harveſt. He that has begun the good work will alſo finiſh it. It is reaſonable to expect this illuſtrious ſucceſs of the goſpel, both from the nature of the thing, and from the prophecies contained in the ſacred ſcriptures. The precepts of the goſpel, in their genuine ſenſe, are admirably calculated for the peace and welfare both of individuals and ſociety. The greateſt liberality of mind, the greateſt generoſity of temper, the moſt unbounded love, and the greateſt indifference to the accumulation of this world's property, if they glowed from breaſt to breaſt, and operated with equal force on all men, would be productive of equal good and happineſs to all. We are ſcarcely able to perceive the force of this at firſt view, becauſe the deceit and impoſition which yet exiſt in the world, prevent the operation of the beſt principles even in the beſt hearts. But in proportion to the improvement of mankind, what is their real intereſt, and what are the real objects of happineſs, will gradually unfold. The contempt of vice will be greater in proportion to the ſcarcity of it: for one villain gives countenance and ſupport to another, juſt as iron ſharpeneth iron. This opens to our view another fact connected with the practice of Chriſtianity, namely, that the nearer it arrives to its perfect ſtate, it will be the more rapid in its progreſs. The beauty of holineſs will be more viſible; and, in the ſtrong language of the prophet, "the earth ſhall bring forth in one day, and a nation ſhall be born at once *." This future perfection of the goſpel is conſiſtent with its nature and importance.—We can ſcarcely believe that means ſo admirably adapted to the reformation of mankind ſhould be without their effect; and if the moſt difficult part be already accompliſhed, we have no reaſon to apprehend that the ſcheme will not be completed. This fact is alſo clearly the ſubject of ancient prophecy. For "thus ſaith the Lord †, I will extend peace to her like a river, and the glory of the Gentiles like a flowing ſtream. And it ſhall come to paſs, from one ſabbath to another, and from one new moon to another, ſhall all fleſh come to worſhip before me, ſaith the Lord."—"Violence ſhall be no more heard in thy land, waſting nor deſtruction within thy border; but thou ſhalt call thy walls ſalvation, and thy gates praiſe." (Iſ. lx. 18.)

Without entering more minutely on the prophecy already quoted from chap. xx. of the book of the Revelation, it is ſufficient to obſerve, that Dr Whitby, in his treatiſe on the millenium at the end of his commentary endeavours to prove, from the ſpirit of the paſſage and the ſimilarity of the expreſſions with thoſe of other prophets, that it refers to a ſtate of the church for a thouſand years, which ſhall be like life from the dead. The commencement of this period is connected with two events; the fall of antichriſt, and the converſion of the Jews. The latter of theſe events he conſiders as a key to all the prophecies concerning the millenium. As the Jews were the ancient people of God, and as their converſion is to be the previous ſtep to the general knowledge of Chriſtianity, the prophecies of the millenium have a chief relation to this important event. We have already obſerved, that God never interpoſes with miraculous power to produce what can be effected by natural means; and from what we know of human nature, we cannot but perceive that the converſion of the Jews will powerfully operate to the general converſion of mankind. Freed from thoſe prejudices which now make them the objects of hatred in all nations, and fired with that zeal by which new converts are always actuated, they will preach the goſpel with a fervour of which we, who have long been bleſſed with its rays, can hardly form a conception; and, by their preſent diſperſion over the whole earth, they will be enabled to adapt their inſtructions to every individual of the

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* Iſ. lxvi. 8.

† Ver. 12, 23.

human race in the language of his fathers. Indeed, if they are not at ſome future period to be employed by Providence for this purpoſe, it is difficult, if not impoſſible, to give any reaſon for their diſperſed ſtate and political exiſtence. Juſt now it muſt be confeſſed that they are the moſt implacable enemies of the Chriſtian name; but their converſion is not on that account more unlikely or improbable than were events which have taken place of nearly equal importance a very few years ago. On the whole, the perfection of Chriſtianity is a doctrine of reaſonable expectation to the church; and it is impoſſible for the advocates for natural religion to deny, that unlimited obedience to its precepts is conſiſtent with the pureſt ſtate of liberty and of happineſs. This is the only millenium which the prophets and apoſtles, as we underſtand them, promiſe to the ſaints; but as men figuring in the very firſt ranks of learning have thought otherwiſe, we would not be too confident that our interpretation is juſt.—Such of our readers as wiſh for further information, will find it in the works of Mr Mede, biſhop Newton, Dr Whitby, and Dr Gill; and to thoſe maſterly writers we refer them for that ſatisfaction which in ſuch an article as this cannot be given.

MILLEPES, or WOOD-LOUSE, in zoology; a ſpecies of ONISCUS. Theſe inſects are found in cellars, under ſtones, and in cold moiſt places; in the warmer countries they are rarely met with. Millepedes have a faint diſagreeable ſmell, and a ſomewhat pungent, ſweetiſh, nauſeous taſte. They have been highly celebrated in ſuppreſſions of urine, in all kinds of obſtructions of the bowels, in the jaundice, weakneſs of ſight, and variety of other diſorders. Whether they have any juſt title to theſe virtues is greatly to be doubted; thus much is certain, that their real effects come far ſhort of the character uſually give them.

MILLEPORA, in natural hiſtory, a name by which Linnæus diſtinguiſhes that genus of lithophytes, of a hard ſtructure and full of holes, which are not ſtellate or radiated, and whoſe animal is the hydra, in which it differs from the madrepora, and comprehending 14 different ſpecies.

In the millepora, the animal which forms and inhabits it occupies the ſubſtance; and it is obſerved that the milleporæ grow upon one another; their little animals produce their ſpawn; which attaching itſelf either to the extremity of the body already formed, or underneath it, gives a different form to this production. Hence the various ſhapes of the millepora, which is compoſed of an infinite number of the cells of thoſe little inſects, which all together exhibit different figures, though every particular cellula has its eſſential form, and the ſame dimenſions, according to its own ſpecies.

MILLET, in botany. See MILIUM.

MILLIARE, or MILLIARIUM, a Roman mile, which conſiſted of 1000 paces, *mille paſſus*, whence the name.

MILLIARIUM AUREUM, was a gilded pillar in the forum of Rome, at which all the highways of Italy met, as one common centre. From this pillar the miles were counted, and at the end of every mile a ſtone was put down. The milliary column was erected by Auguſtus Cæſar, and, as we are informed by travellers, is ſtill to be ſeen.

MILLING of CLOTH. See FULLING.

MILLION, in arithmetic, the ſum of ten hundred thouſand, or a thouſand times a thouſand. See ARITHMETIC.

MILLO, a part of mount Zion at its extremity; and therefore called *Millo* of the city of David (2 Chron. xxxii.), taken in with the wall that encompaſſed mount Zion. Uncertain whether *Beth-Millo*, (Judges ix. 20.) denotes a place; if it did, it lay near Sechem.

MILLOT (Claude Francis Xavier), of the French academy, was born at Beſançon March 1726, and was for ſome time Jeſuit. He was conſecrated for the pulpit, and continued to preach after he left the ſociety: But the weakneſs of his voice, his timidity, and the awkwardneſs of his manner, not permitting him to continue in this profeſſion, he relinquiſhed it, although he had preached Advent ſermons at Verſailles, and Lent ſermons at Luneville. The Marquis de Felino, miniſter of Parma, inſtituted an hiſtorical claſs for the benefit of the young nobility; and, at the deſire of M. le Duc de Nivernois, he gave the charge of it to the Abbé Millot. The miniſter having occaſioned a kind of rebellion among the people by ſome innovations which he had made in the ſtate, the Abbé continued attached to the intereſts of his patron, and would not deſert him till the ſtorm was blown over. When he was told that he would loſe his place by this conduct, he replied, "My place is with a virtuous perſecuted man who has been my benefactor; and that I ſhall never loſe." At length, having filled the hiſtorical chair with great approbation, he returned to France, and was appointed preceptor to M. le Duc d'Enghien. In this ſituation he died, A. D. 1785, aged 59. The Abbé Millot did not ſhine in company; he was cold and reſerved in his manner; but every thing he ſaid was judicious, and exactly in point.—D'Alembert ſaid, that of all his acquaintance the Abbé Millot had the feweſt prejudices and the leaſt pretenſion. He compoſed ſeveral works, which are digeſted with great care, and written in a pure, ſimple, and natural ſtyle. The principal are, 1. *Elemens de l' Hiſtoire de France, depuis Clovis juſque a Louis XIV.* 3 vols in 12mo. The author, ſelecting the moſt curious and important facts, has ſuppreſſed every thing foreign to the ſubject; and has not only arranged the materials in their proper order, but choſen them with the greateſt judgment. Querlon thought this the beſt abridgment which we have of the hiſtory of France, and preferred it to that of the Preſident Henault. 2. *Elemens de l'Hiſtoire d'Angleterre, depuis ſon origine ſous les Romains, juſqu' à George II.* 3 vols. 12mo. In this valuable abridgment, the author ſatisfies, without tiring, his readers. It is all that is neceſſary for thoſe who wiſh to gain a general knowledge of the Engliſh hiſtory, without entering minutely into its particular parts.—3. *Elemens de l'Hiſtoire Univerſelle*, 9 vols. 12mo. A certain critic maintains, that this work is merely a counterfeit of Voltaire's general hiſtory. But this cenſure is altogether unjuſt. The ancient hiſtory in this work is wholly compoſed by the Abbé Millot; and, no leſs than the modern part, diſcovers his abilities in the choice of facts, in diveſting them of uſeleſs circumſtances, in relating them without prejudice, and in adorning them with judicious reflections. 4. *L'Hi-*

Millot, Milo.

ſtoire des Troubadours, 3 vols. 12mo. compiled from the manuſcripts of M. de Sainte-Palaie. This work appears rather tedious, becauſe it treats of men almoſt unknown, and moſt of them deſerving to be ſo. What is there quoted from the Provencal poets is not at all intereſting; and, according to the obſervation of a man of wit, "it ſerves no purpoſe to ſearch curiouſly into a heap of old ruins while we have modern palaces to engage our attention." 5. *Memoires politiques et Militaires, pour ſervir à l'Hiſtoire de Louis XIV. et de Louis XV.* compoſed from original papers collected by Adrian Maurice duc de Noailles, marſhal of France, in 6 vols 12mo. 6. The Abbé Millot publiſhed alſo ſeveral Diſcourſes, in which he diſcuſſes a variety of philoſophical queſtions, with more ingenuity of argument than fire of expreſſion; and a tranſlation of the moſt ſelect harangues in the Latin hiſtorians; of which it has been remarked, as well as of the orations of the Abbé d'Olivet, that they are coldly correct, and elegantly inſipid. The character of the author, more prudent and circumſpect than lively and animated, ſeldom elevated his imagination above a noble ſimplicity without warmth, and a pure ſtyle without oſtentation. Some of the critics, however, have accuſed him of declamation in ſome parts of his hiſtories, particularly in thoſe parts which concern the clergy. But, in our opinion, the word declamation is totally inapplicable to the writings of the Abbé Millot. He flatters, it is true, neither prieſts nor ſtateſmen; and he relates more inſtances of vicious than of virtuous actions, becauſe the one are infinitely more common than the other: But he relates them coldly; and he appears to be guided more by ſincerity and a love of truth, than by that partial philoſophy which blames the Chriſtian religion for thoſe evils which it condemns.

MILO, a celebrated athlete of Crotona in Italy. His father's name was Diotimus. He early accuſtomed himſelf to carry the greateſt burdens, and by degrees became a prodigy of ſtrength. It is ſaid that he carried on his ſhoulders a young bullock, four years old, for above forty yards; and afterwards killed it with one blow of his fiſt, and eat it up in one day. He was ſeven times crowned at the Pythian games, and ſix at the Olympian. He preſented himſelf a ſeventh time; but no one had the courage or boldneſs to enter the liſts againſt him. He was one of the diſciples of Pythagoras; and to his uncommon ſtrength, it is ſaid, the learned preceptor and his pupils owed their lives. The pillar which ſupported the roof of the ſchool ſuddenly gave way; but Milo ſupported the whole weight of the building, and gave the philoſopher and his auditors time to eſcape. In his old age, Milo attempted to pull up a tree by the roots, and break it. He partly effected it; but his ſtrength being gradually exhauſted, the tree when half cleft re-united, and his hands remained pinched in the body of the tree. He was then alone; and, being unable to diſentangle himſelf, he was devoured by the wild beaſts of the place, about 500 years before the Chriſtian æra.

MILO (T. Annius), a native of Lanuvium, who attempted to obtain the conſulſhip at Rome by intrigue and ſeditious tumults. Clodius the tribune oppoſed his views; yet Milo would have ſucceeded but for the following event: As he was going into the country, attended by his wife and a numerous retinue of gladiators and ſervants, he met on the Appian road his enemy Clodius, who was returning to Rome with three of his friends and ſome domeſtics completely armed.—A quarrel aroſe between the ſervants. Milo ſupported his attendants, and the diſpute became general.—Clodius received many ſevere wounds, and was obliged to retire to a neighbouring cottage. Milo purſued his enemy in his retreat, and ordered his ſervants to diſpatch him. The body of the murdered tribune was carried to Rome, and expoſed to public view. The enemies of Milo inveighed bitterly againſt the violence and barbarity with which the ſacred perſon of a tribune had been treated. Cicero undertook the defence of Milo; but the continual clamours of the friends of Clodius, and the ſight of an armed ſoldiery, which ſurrounded the ſeat of judgment, ſo terrified the orator, that he forgot the greateſt part of his arguments, and the defence he made was weak and injudicious.—Milo was condemned, and baniſhed to Maſſilia. Cicero ſoon after ſent his exiled friend a copy of the oration which he had prepared for his defence, in the form in which we have it now; and Milo, after he had read it, exclaimed, *O Cicero, hadſt thou ſpoken before my accuſers in theſe terms, Milo would not be now eating figs at Marſeilles.* The friendſhip and cordiality of Cicero and Milo were the fruits of long intimacy and familiar intercourſe. It was to the ſucceſsful labours of Milo that the orator was recalled from baniſhment, and reſtored to his friends.

Milo.

MILO, (anciently *Melos)*, an iſland in the Archipelago, about 50 miles in circumference, with a harbour, which is one of the largeſt in the Mediterranean. The principal town is of the ſame name as the iſland, and was prettily built, but abominably naſty: the houſes are two ſtories high, with flat roofs; and are built with a ſort of pumic-ſtone, which is hard, blackiſh, and yet very light.

This iſland was formerly rich and populous. From the earlieſt times of antiquity it enjoyed pure liberty. The Athenians, not being able to perſuade the Melians to declare in their favour in the Peloponneſian war, made a deſcent upon the iſland, and attacked them vigorouſly. In two different expeditions they failed of their purpoſe: but returning with more numerous forces, they laid ſiege to Melos; and, obliging the beſiged to ſurrender at diſcretion, put to the ſword all the men who were able to bear arms. They ſpared only the women and children, and theſe they carried into captivity. This act of cruelty put humanity to the bluſh, and diſgraces the Athenian name. But war was then carried on with a degree of wild rage, unexampled in the preſent times. That republic knew not how to pardon, and always carried its vengeance to an extravagant height. When Lyſander, the Lacedemonian general, came to give law to the Athenians, he expelled the colony which they had ſent to Melos, and re-eſtabliſhed the unfortunate remains of its original inhabitants.

This iſland loſt its liberty when Rome, aſpiring to the empire of the world, conquered all the iſles of the Archipelago. In the partition of the empire, it fell to the ſhare of the eaſtern emperors, was governed by particular dukes, and was at laſt conquered by Soliman II. Since that period, it has groaned under the yoke of Turkiſh deſpotiſm, and has loſt its opulence and ſplendor. At the commencement of the preſent century, it boaſted of 17 churches, and 11 chapels, and contained more than 20,000 inhabitants. It was very fertile in corn, wine and fruits; and the whole ſpace from the town to the harbour, which is nearly two miles, was laid out in beautiful gardens. M. Tournefort, who viſited it in the year 1700, gives a fine deſcription of it. "The earth, being conſtantly warmed by ſubterraneous fires, produced almoſt without interruption plenteous crops of corn, barley, cotton, exquiſite wines, and delicious melons. St Elias, the fineſt monaſtery in the iſland, and ſituated on the moſt elevated ſpot, is encircled with orange, citron, cedar, and fig trees. Its gardens are watered by a copious ſpring. Olive trees, of which there are but few in the other parts of the iſland, grow in great numbers around this monaſtery. The adjacent vineyards afford excellent wine. In a word, all the productions of the iſland are the very beſt of their kinds; its patridges, quails, kids, and lambs, are highly valued, and yet may be bought at a very cheap price."

Letters Greece, et. 42.

Were M. Tournefort to return to Milo, M. Savary * aſſures us, he would no longer ſee the fine iſland which he has deſcribed. "He might ſtill ſee alum, in the form of feathers, and fringed with ſilver thread, hanging from the arches of the caverns; pieces of pure ſulphur filling the cliffs of the rocks; a variety of mineral ſprings; hot baths, (though theſe are now only a ſet of ſmall dirty caves); the ſame ſubterraneous fires which in his days warmed the boſom of the earth, and were the cauſe of its extraordinary fertility: but inſtead of 5000 Greeks, all paying the capitation tax (A), he would now find no more than about 700 inhabitants on an iſland 18 leagues in circumference. He would ſigh to behold the fineſt lands lying uncultivated, and the moſt fertile valleys converted into moraſſes; of the gardens ſcarcely a veſtige left; three-fourths of the town in ruins, and the inhabitants daily decreaſing. In ſhort, during the laſt 50 years, Milos has aſſumed a quite different appearance. The plague, which the Turks propagate every where, has cut off one part of its inhabitants; the injudicious adminiſtration of the Porte, and the oppreſſive extortions of the Captain Pacha, have deſtroyed the reſt. At preſent, for want of hands, they cannot cut out a free channel for their waters, which ſtagnate in the valleys, corrupt, and infect the air with their putrid exhalations. The ſalt marſhes, of which there are numbers in the iſland, being equally neglected, produce the ſame effect. Add to theſe inconveniences, thoſe ſulphureous exhalations which ariſe all over the iſland, and by which the inhabitants of Milos are afflicted with dangerous fevers during three-fourths of the year. Perhaps they may be obliged to forſake their country. Every countenance is yellow, pale, and livid; and none bears any mark of good health. The prudent traveller will be careful to ſpend but a very ſhort time in this unwholeſome country, unleſs he chooſes to expoſe himſelf to the danger of catching a fever. To ſleep over-night, or to ſpend but one day in the iſland, is often enough to occaſion his being attacked with that diſtemper.

"Yet (continues our author) a judicious and enlightened government might expel thoſe evils which ravage Milos. Its firſt care would be to eſtabliſh a lazaretto, and to prohibit veſſels whoſe crews or cargoes are infected with the plague from landing. Canals might next be cut, to drain the marſhes, whoſe exhalations are ſo pernicious. The iſland would then be re-peopled. The ſulphureous vapours are not the moſt noxious. Theſe prevailed equally in ancient times, yet the iſland was then very populous. M. Tournefort, who travelled through it at a time leſs diſtant from the period when it was conquered by the Turks, and when they had not yet had time to lay it waſte, reckons the number of its inhabitants (as we have ſaid) at about 20,000. The depopulation of Milos is therefore to be aſcribed to the deſpotiſm of the Porte, and its deteſtable police."

Sutherland's Tour up the Straits, p. 146.

The women of Milo once ſo celebrated for their beauty, are now ſallow, unhealthy, and diſguſtingly ugly; and render themſelves ſtill more hideous by their dreſs, which is a kind of looſe jacket, with a white coat and petticoat, that ſcarcely covers two-thirds of their thighs, barely meeting the ſtocking above the knee. Their hind hair hangs down the back in a number of plaits; that on the fore part of the head is combed down each ſide of the face, and terminated by a ſmall ſtiff curl, which is even with the lower part of the cheek. All the inhabitants are Greeks, for the Turks are not fond of truſting themſelves in the ſmall iſlands; but every ſummer the captain baſhaw goes round with a ſquadron to keep them in ſubjection, and to collect the revenue. When the Ruſſians made themſelves maſters of the Archipelago during the late war, many of the iſlands declared in their favour; but being abandoned by the peace, they were ſo ſeverely mulcted by the Grand Signior, that they have profeſſed a determination to remain perfectly quiet in future. As the Turks, however do not think them worth a garriſon, and will not truſt them with arms and ammunition, all thoſe which the Ruſſians may chooſe to invade will be obliged to ſubmit. The two points which form the entrance of the harbour, croſſing each other, render it imperceptible until you are cloſe to it. Thus, while you are perfectly ſecure within it, you find great difficulty in getting out, particularly in a northerly wind; and as no trade is carried on except a little in corn and ſalt, Milo would ſcarcely ever be viſited, were it not that, being the firſt iſland which one makes in the Archipelago, the pilots have choſen it for their reſidence. They live in a little town on the top of a high rock, which, from its ſituation and appearance, is called the *caſtle.*—Patridges ſtill abound in this iſland; and are ſo cheap, that you may buy one for a charge of powder only. The peaſants get them by ſtanding behind a portable ſcreen, with a ſmall aperture in the centre, in which they place the muzzle of their piece, and then draw the

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(A) Grown up men are the only perſons who pay the capitation tax. Therefore, by adding to the number of 5000 who paid the tax, the women, boys, and girls, we find that Milos, in the days of Tournefort, contained at leaſt 20,000 ſouls.

the partridges by a call. When a ſufficient number are collected, they fire among them, and generally kill from four to ſeven at a ſhot: but even this method of getting them is ſo expenſive, from the ſcarcity of ammunition, that the people can never afford to ſhoot them, except when there are gentlemen in the iſland, from whom they can beg a little powder and ſhot

Milo is 60 miles north of Candia; and the town is ſituated in E. Long. 25. 15. N. Lat. 36. 27.

MILSTONE. See Mill-stone.

MILT, in anatomy, a popular name for the Spleen.

Milt, or *Melt*, in natural hiſtory, the ſoft roe in fiſhes; thus called from its yielding, by expreſſion, a whitiſh juice reſembling milk. See Roe.

The milt is properly the ſeed or ſpermatic part of the male fiſh. The milt of a carp is reckoned a choice bit. It conſiſts of two long whitiſh irregular bodies, each included in a very thin fine membrane. M. Petit conſiders them as the teſticles of the fiſh wherein the ſeed is preſerved; the lower part, next the anus, he takes for the *veſiculæ ſeminales*.

MILTHORP, a port-town of Weſtmoreland, at the mouth of the Can, five miles from Kendal. It is the only ſea-port in the county; and goods are brought hither in ſmall veſſels from Grange in Lancaſhire. Here are two paper-mills. It has a market on Friday, and a fair on Old May-day; and there is a good ſtone-bridge over the river Betha, which runs through the town.

MILTIADES, an Athenian captain, ſon of Cypſelus. He obtained a victory in a chariot race at the Olympic games. He led a colony of Athenians to the Cherſoneſus. The cauſes of this appointment are ſtriking and ſingular. The Thracian Dolonci, haraſſed by a long war with the Abſynthians, were directed by the oracle of Delphi to take for their king the firſt man they met in their return home, who invited them to come under his roof and partake his entertainments. This was Miltiades, whom the appearance of the Dolonci, with their ſtrange arms and garments, had ſtruck. He invited them to his houſe, and was made acquainted with the commands of the oracle. He obeyed; and when the oracle of Delphi had approved a ſecond time the choice of the Dolonci, he departed for the Cherſoneſus, and was inveſted by the inhabitants with ſovereign power. The firſt meaſures he took was to ſtop the further incurſions of the Abſynthians, by building a ſtrong wall acroſs the Iſthmus. When he had eſtabliſhed himſelf at home, and fortified his dominions againſt foreign invaſion, he turned his arms againſt Lampſacus. His expedition was unſucceſsful; he was taken in an ambuſcade, and made priſoner. His friend Crœſus king of Lydia was informed of his captivity, and procured his releaſe. He lived few years after he had recovered his liberty. As he had no iſſue, he left his kingdom and poſſeſſions to Steſagoras the ſon of Cimon, who was his brother by the ſame mother. The memory of Miltiades was greatly honoured by the Dolonci, and they regularly celebrated feſtivals and exhibited ſhows in commemoration of a man to whom they owed their greatneſs and preſervation.

Miltiades, the ſon of Cimon, and brother of Steſagoras mentioned in the preceding article, was ſome time after the death of the latter, who died without iſſue, ſent by the Athenians with one ſhip to take poſſeſſion of the Cherſoneſus. At his arrival Miltiades appeared mournful, as if lamenting the recent death of his brother. The principal inhabitants of the country viſited the new governor to condole with him; but their confidence in his ſincerity proved fatal to them. Miltiades ſeized their perſons, and made himſelf abſolute in Cherſoneſus. To ſtrengthen himſelf, he married Hegeſipyla, the daughter of Olorus the king of the Thracians. His triumph was ſhort. In the third year of his government, his dominions were threatened by an invaſion of the Scythian Nomades, whom Darius had ſome time before irritated by entering their country. He fled before them; but as their hoſtilities were of ſhort duration, he was ſoon reſtored to his kingdom. Three years after, he left Cherſoneſus; and ſet ſail for Athens, where he was received with great applauſe. He was preſent at the celebrated battle of Marathon; in which all the chief officers ceded their power to him, and left the event of the battle to depend upon his ſuperior abilities. He obtained an important victory over the more numerous forces of his adverſaries. Some time after, Militades was intruſted with a fleet of 70 ſhips, and ordered to puniſh thoſe iſlands which had revolted to the Perſians. He was ſucceſsful at firſt; but a ſudden report that the Perſian fleet was coming to attack him, changed his operations as he was beſieging Paros. He raiſed the ſiege, and returned to Athens. He was accuſed of treaſon, and particularly of holding correſpondence with the enemy. The falſity of theſe accuſations might have appeared, if Miltiades had been able to come into the aſſembly. But a wound which he had received before Paros detained him at home, and his enemies, taking advantage of his abſence, became more eager in their accuſations, and louder in their clamours. He was condemned to death; but the rigour of his ſentence was retracted on the recollection of his great ſervices to the Athenians, and he was put into priſon till he had paid a fine of 50 talents to the ſtate. His inability to diſcharge ſo great a ſum detained him in confinement; and his wounds becoming incurable, he died a priſoner about 489 years before the Chriſtian æra. His body was ranſomed by his ſon Cimon; who was obliged to borrow and pay the 50 talents, to give his father a decent burial.—The accuſations againſt Miltiades were probably the more readily believed by his countrymen, when they remembered how he made himſelf abſolute in Cherſoneſus; and in condemning the barbarity of the Athenians towards a general, who was the ſource of their military proſperity, we muſt remember the jealouſy which ever reigns among a free and independent people, and how watchful they are in defence of the natural rights which they ſee wreſted from others by violence. Cornelius Nepos has written the life of Miltiades the ſon of Cimon; but his hiſtory is incongruous and unintelligible, from his confounding the actions of the ſon of Cimon with thoſe of the ſon of Cypſelus. Greater reliance is to be placed on the narration of Herodotus, whoſe veracity is confirmed, and who was indiſputably better informed and more capable of giving an account of

Milton. the life and exploits of men who flouriſhed in his age, and of which he could ſee the living monuments. Herodotus was born about ſix years after the famous battle of Marathon; and C. Nepos, as a writer of the Auguſtan age, flouriſhed about 450 years after the age of the father of hiſtory.

MILTON (John,) the moſt illuſtrious of the Engliſh poets, was deſcended of a genteel family, ſeated at a place of their own name, viz. *Milton*, in Oxfordſhire. He was born December 9, 1608, and received his firſt rudiments of education under the care of his parents, aſſiſted by a private tutor. He afterwards paſſed ſome time at St Paul's ſchool, London; in which city his father had ſettled, being engaged in the buſineſs of a ſcrivener. At the age of 17, he was ſent to Chriſt's college, Cambridge; where he made a great progreſs in all parts of academical learning; but his chief delight was in poetry. In 1628, he proceeded bachelor of arts, having performed his exerciſe for it with great applauſe. His father deſigned him for the church; but the young gentleman's attachment to the muſes was ſo ſtrong, that it became impoſſible to engage him in any other purſuits. In 1632, he took the degree of maſter of arts; and having now ſpent as much time in the univerſity as became a perſon who determined not to engage in any of the three profeſſions, he left the college, greatly regretted by his acquaintance, but highly diſpleaſed with the uſual method of training up youth there for the ſtudy of divinity; and being much out of humour with the public adminiſtration of eccleſiaſtical affairs, he grew diſſatisfied with the eſtabliſhed form of church-government, and diſliked the whole plan of education practiſed in the univerſity. His parents, who now dwelt at Horton, near Colnbrook, in Buckinghamſhire, received him with unabated affection, notwithſtanding he had thwarted their views of providing for him in the church, and they amply indulged him in his love of retirement; wherein he enriched his mind with the choiceſt ſtores of Grecian and Roman literature: and his poems of *Comus*, *L'Allegro*, *Il Penſeroſo*, and *Lycidas*, all wrote at this time, would have been ſufficient, had he never produced any thing more conſiderable, to have tranſmitted his fame to lateſt poſterity. However, he was not ſo abſorbed in his ſtudies as not to make frequent excurſions to London; neither did ſo much excellence paſs unnoticed among his neighbours in the country, with the moſt diſtinguiſhed of whom he ſometimes choſe to relax his mind, and improve his acquaintance with the world as well as with books. —After five years ſpent in this manner, he obtained his father's permiſſion to travel for farther improvement.—At Paris he became acquainted with the celebrated Hugo Grotius; and from thence travelling into Italy, he was every where careſſed by perſons of the moſt eminent quality and learning.

Upon his return home, he ſet up a genteel academy in Alderſgate-ſtreet.—In 1641, he began to draw his pen in defence of the Preſbyterian party; and the next year he married the daughter of Richard Powell, Eſq; of Foreſt-Hill in Oxfordſhire. This lady, however, whether from a difference on account of party, her father being a zealous royaliſt, or ſome other cauſe, ſoon thought proper to return to her relations; which ſo incenſed her huſband, that he reſolved never to take her again, and wrote and publiſhed ſeveral tracts in defence of the doctrine and diſcipline of divorce. He even made his addreſſes to another lady; but this incident proved the means of a reconciliation with Mrs Milton.

Milton. In 1644, he wrote his Tract upon Education; and the reſtraint on the liberty of the preſs being continued by act of parliament, he wrote boldly and nobly againſt that reſtraint. In 1645, he publiſhed his juvenile poems; and about two years after, on the death of his father, he took a ſmaller houſe in High Holborn, the back of which opened into Lincoln's-Inn Fields.—Here he quietly proſecuted his ſtudies, till the fatal cataſtrophe and death of Charles I.; on which occaſion he publiſhed his Tenure of Kings and Magiſtrates, in juſtification of the fact. He was now taken into the ſervice of the commonwealth, and made Latin ſecretary to the council of ſtate, who reſolved neither to write to others abroad, nor to receive any anſwers, except in the Latin tongue, which was common to them all. The famous *Εἰκὼν βασιλικὴ* coming out about the ſame time, our author, by command, wrote and publiſhed his *Iconoclaſtes* the ſame year. It was alſo by order of his maſters, backed by the reward of 1000 l. that, in 1651, he publiſhed his celebrated piece, entitled *Pro Populo Anglicano Defenſio.* "A Defence of the People of England, in anſwer to Salmaſius's Defence of the King;" which performance ſpread his fame over all Europe.—He now dwelt in a pleaſant houſe, with a garden, in Petty France, Weſtminſter, opening into St James's Park. In 1652, he buried his wife, who died not long after the delivery of her fourth child; and about the ſame time he alſo loſt his eye-ſight, by a *gutta ſerena*, which had been growing upon him many years.

Cromwell took the reigns of government into his own hands in the year 1653; but Milton ſtill held his office. His leiſure-hours he employed in proſecuting his ſtudies; wherein he was ſo far from being diſcouraged by the loſs of his ſight, that he even conceived hopes this misfortune would add new vigour to his genius; which, in fact, ſeems to have been the caſe.—Thus animated, he again ventured upon matrimony: his ſecond lady was the daughter of Captain Woodſtock of Hackney: ſhe died in childbed about a year after. On the depoſition of the protector, Richard Cromwell, and on the return of the long parliament, Milton being ſtill continued ſecretary, he appeared again in print; pleading for a farther reformation of the laws relating to religion; and, during the anarchy that enſued, he drew up ſeveral ſchemes for re-eſtabliſhing the commonwealth, exerting all his faculties to prevent the return of Charles II. England's deſtiny, however, and Charles's good fortune, prevailing, our author choſe to conſult his ſafety, and retired to a friend's houſe in Bartholomew-Cloſe. A particular proſecution was intended againſt him; but the juſt eſteem to which his admirable genius and extraordinary accompliſhments entitled him, had raiſed him ſo many friends, even among thoſe of the oppoſite party, that he was included in the general amneſty.

This ſtorm over, he married a third wife, Elizabeth, daughter of Mr Minſhall a Cheſhire gentleman; and not long after he took a houſe in the Artillery Walk, leading to Bunhill-Fields. This was his laſt-ſtage: here he ſat down for a longer continuance than he had been able to do any where; and though he had loſt his fortune (for every thing belonging to him went to wreck at the Reſtoration), he did not loſe his taſte for literature, but continued his ſtudies with almoſt as much ardour as ever; and applied himſelf particularly to the finiſhing his grand work, the *Paradiſe Loſt;* one of the nobleſt poems that ever was produced by human genius.—It was publiſhed in 1667, and his *Paradiſe Regained* came out in 1670.—This latter work fell ſhort of the excellence of the former production; although were it not for the tranſcendent merit of Paradiſe Loſt, the ſecond compoſition would doubtleſs have ſtood foremoſt in the rank of Engliſh epic poems. After this he publiſhed many pieces in proſe; for which we refer our readers to the edition of his Hiſtorical, Poetical, and Miſcellaneous Works, printed by Millar, in 2 vols. 4to, in 1753.

In 1674, this great man paid the laſt debt to nature at his houſe in Bunhill-Fields, in the 66th year of his age; and was interred on the 12th of November, in the chancel of St Giles's, Cripplegate.—A decent monument was erected to his memory, in 1737, in Weſtminſter abbey, by Mr Benſon, one of the auditors of the impreſt.—As to his perſon, it was remarkably handſome; but his conſtitution was tender, and by no means equal to his inceſſant application to his ſtudies.—Though greatly reduced in his circumſtances, yet he died worth 1500l. in money, beſide his houſehold goods.—He had no ſon; but left behind him three daughters, whom he had by his firſt wife.

MILTON, the name of ſeveral places in England; particularly,

Milton, or *Middleton*, in Dorſetſhire, ſouth-weſt of Blandford, near the road to Dorcheſter, 114 miles from London. It is chiefly noted for its abbey, built by king Athelſtan. The church ſtands near the ſouth ſide of the abbey. It is a large and magnificent pile of Gothic architecture, and contains ſeveral ancient monuments. Here is an alms-houſe for ſix people, who have 12 s. a week, and three yards of cloth for a gown, one pair of ſhoes and ſtockings, and 10 s. each on St Thomas's day yearly. Here is a free-ſchool, and a market on Tueſdays.

Milton, in Kent, near Sittinbourn and the Iſle of Sheppey, 6 miles north-weſt of Feverſham, and 40 from London. It is alſo called *Middleton* from its ſituation near the middle of the county, *i. e.* from Deptford to the Downs. The kings of Kent had a palace here, which was caſtellated, and ſtood below the church; but was burnt down in Edward the Confeſſor's time by Earl Godwin, &c. Its church ſtands near a mile off. On approaching the town up the Thames, by the Eaſt-Swale, it ſeems hid among the creeks: yet it is a large town; and has a conſiderable market on Saturdays, and a fair on July 24. The oyſters taken hereabouts are the moſt famous of any in Kent. This town is governed by a portreeve, choſen yearly on St James's-day, who ſuperviſes the weights and meaſures all over the hundred of Milton.

Milton, in Kent, a mile on the eaſt ſide of Graveſend, was incorporated with it in the reign of Queen Elizabeth, by the name of the portreeve, jurats, and inhabitants of the towns of Graveſend and Milton. King Henry VIII. raiſed a platform or block-houſe here, for the defence both of this town and Graveſend, and the command of the river. It has a fair Jan. 25.

MILVIUS Molvius, or Mulvius, *Pons;* a bridge on the Tiber, built by Æmilius Scaurus the cenſor, in the time of Sylla, at two miles diſtance from the city, on the Via Flaminia, and repaired by Auguſtus. From this bridge the ambaſſadors of the Allobroges were brought back to Rome, by Cicero's management, and made a diſcovery of Cataline's conſpiracy (Salluſt). Near it Maxentius was defeated by Conſtantine (Eutropius). Now called *Ponte Molle.*

Milvius, in ornithology, a ſpecies of Falco.

MIMI, Mimes, in the ancient comedy, were buffoons or mimics, who entertained the people by taking off certain characters, uſing ſuch geſtures as ſuited the perſons or ſubjects they repreſented. There were on the Roman ſtage female performers of this kind called *mimæ.* The word is derived from *μιμεομαι, I imitate.* Some of the *mimi* acted their parts to the ſound of the *tibia;* theſe they called *mimauli.*

Mimi were alſo a kind of farces or ludicrous comedies, generally performed by one perſon. They had no acts, nor any *exordium.*—The *mimi* were introduced upon the Roman ſtage long after comedy and tragedy had arrived at their full perfection. The actor wore no maſk, but ſmeared his face with ſoot, was dreſſed in lambſkin, wore garlands of ivy, and carried a baſket of flowers and herbs, in honour of Bacchus, and diverted the audience with apiſh tricks and ridiculous dances. This was the ſtate of the *mimi* ſoon after their firſt introduction; but they underwent many alterations, which it would take up too much room to relate, and which are not of ſufficient importance to juſtify a detailed account. See Pantomimes.

MIMESIS, in rhetoric, the imitating the voice and geſtures of another perſon.

MIMNERMUS, an ancient poet and muſician, flouriſhed about the beginning of the 6th century B. C. He was of Smyrna, and cotemporary with Solon. Athenæus gives him the invention of pentameter verſe. His elegies, of which only a few fragments are preſerved, were ſo much admired in antiquity, that Horace preferred them to thoſe of Callimachus. He compoſed a poem of this kind, as we learn from Pauſanias, upon the battle fought between the people of Smyrna, and the Lydians, under Gyges. He likewiſe was author of a poem in elegiac verſe, quoted by Strabo, which he entitled *Nanno,* and in which we may ſuppoſe he chiefly celebrated a young and beautiful girl of that name, who, according to Athenæus, was a player on the flute, with whom he was enamoured in his old age. With reſpect to love matters, according to Propertius, his verſes were more valuable than all the writings of Homer.

Plus in amore valet Mimnermi verſus Homero.
Lib. 1. Eleg. 9. v. 11.

And Horace bears teſtimony to his abilities, in deſcribing that ſeducing paſſion:

Si Mimnermus uti cenſet, ſine amore jociſque
Nil eſt jucundum, vivas in amore jociſque.
Epiſt. VI. Lib. i. v. 65.

It, as wiſe Mimnermus ſaid,
Life unbleſt with love and joy
Ranks us with the ſenſeleſs dead,
Let theſe gifts each hour employ.

Alluding to ſome much admired lines of this Greek poet, which have been preſerved by Stobæus.

Τις δε βιος, τι δε τερπνον ατερ χρυσης ’Αφροδιτης, &c.

What is life and all its pride,
If love and pleaſure be denied?
Snatch, ſnatch me hence, ye fates whene'er
The am'rous bliſs I ceaſe to ſhare.
Oh let us crop each fragrant flow'r
While youth and vigour give us pow'r:
For frozen age will ſoon deſtroy
The force to give or take a joy;
And then, a prey to pain and care,
Deteſted by the young and fair,
The ſun's bleſt beams will hateful grow,
And only ſhine on ſcenes of wo.

MIMOSA, the SENSITIVE PLANT: A genus of the polygamia order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 33d order, *Lomentaceæ*. The hermaphrodite calyx is quinquedentate; the corolla quinquefid; there are five or more ſtamina, one piſtil, and a legumen: The male calyx is quinquedentate; the corolla quinquefid; with five, ten, or more ſtamina.

The name *mimoſa* ſignifies "mimic;" and is given to this genus on account of the ſenſibility of the leaves, which, by their motion, mimic or imitate, as it were, the motion of animals. See SENSITIVE *Plant*.

To this genus Linnæus joins many of the *acacias;* and it compriſes near 60 different ſpecies, all natives of warm climates. Of the ſorts cultivated here in our ſtoves, &c. ſome are of the ſhrub and tree kind, and two or three are herbaceous perennials and annuals. The ſenſitive kinds are exceedingly curious plants in the very ſingular circumſtance of their leaves receding rapidly from the touch, and running up cloſe together; and in ſome ſorts the footſtalks and all are affected, ſo as inſtantly to fall downward as if faſtened by hinges, which laſt are called *humble* ſenſitives. They have all winged leaves, each wing conſiſting of many ſmall pinnæ.

In the *Syſtema Vegetabilium*, this genus, including the *mimoſas* properly ſo called, and the *acacias*, is divided into ſeveral ſections, diſtinguiſhed by the figure, ſituation, and arrangement, of the leaves; as ſimple, ſimply-pinnated, bigeminous and tergeminous, conjugate and pinnated, doubly pinnated. The following are the moſt remarkable

Species, with their properties. 1. The *Senſitiva*, or common ſenſitive humble plant, riſes with an underſhrubby prickly ſtem, branching ſix or eight feet high, armed with crooked ſpines; conjugated, pinnated leaves, with bijugated patial lobes or wings, having the inner ones the leaſt, each leaf on a long footſtalk; and at the ſides and ends of the branches many purple flowers in roundiſh heads; ſucceeded by broad, flat, jointed pods, in radiated cluſters.—This is ſomewhat of the humble ſenſitive kind; the leaves, footſtalks, and all, receding from the touch, though not with ſuch facility as in ſome of the following ſorts.

2. The *Pudica*, or baſhful humble plant, riſes with an underſhrubby, declinated, prickly ſtem, branching two or three feet around, armed with hairy ſpines; pinnated, digitated leaves, each leaf being of five or more long ſolioles, attached by their baſe to a long footſtalk, and ſpread out above like the fingers of a hand; and at the ſides and ends of the branches roundiſh heads of greeniſh white flowers, ſucceeded by ſmall jointed prickly pods.—This is truly of the humble ſenſitive kind; for by the leaſt touch the leaves inſtantly recede, contract, cloſe, and together with the footſtalk quickly decline downward, as if aſhamed at the approach of the hand.

3. the *Pernambucana*, or Pernambuca ſlothful mimoſa, has unſhrubby, procumbent, unarmed ſtems, branching two or three feet around; bipinnated leaves, of three or four pair of ſhort, winged ſoliola; and at the axillas drooping ſpikes of pentandrous flowers, the lower ones caſtrated.—This ſpecies recedes very ſlowly from the touch, only contracting its pinnæ a little when ſmartly touched; hence the name *ſlothful mimoſa*.

4. The *Aſperata*, or Panama ſenſitive plant. Of this curious ſpecies, which has been well deſcribed by Dr Browne (but not figured), there is a good figure in the *Reliquiæ Houſtonianæ* publiſhed by Sir Joſeph Banks. It grows in moiſt places, and by the ſides of rivulets, in the pariſhes of St James and Hanover, Jamaica. It ſeldom riſes above three feet in height; but its ſlender branches extend conſiderably on the neighbouring buſhes. It is armed with crooked, ſharp, ſpines; ſo thickly ſet on the trunk, branches, and leaves, that there is no touching it with ſafety. But the plant has a beautiful appearance; the flowers are yellow and globular, growing at the extremity of the branches. The pods are hairy, brown, and jointed; each containing a ſmall, flat, and brown ſeed. The leaves are numerous, ſmall, and winged: next to thoſe of the mimoſa pudica, they are the moſt irritable; contracting with the leaſt touch, and remaining ſo for ſeveral minutes after. This ſpecies would form a good hedge or fence round a garden; and by being trimmed now and then by a cutlaſs or gardener's ſciſſars, may be eaſily kept from ſpreading.

5. The *Punctata*, or punctated ſenſitive mimoſa, riſes with a ſhrubby, upright, taper, ſpotted, unarmed ſtem, branching erectly five or ſix feet high; bipinnated leaves, of four or five pair of long winged folioles, having each about 20 pair of pinnæ; and at the axillas and termination of the branches oblong ſpikes of yellowiſh decandrous flowers, the inferior ones caſtrated; ſucceeded above by oblong ſeed-pods. This ſort, though naturally ſhrubby and perennial in its native ſoil, yet in this country it ſometimes decays in winter. It is only ſenſitive in the foliola, but quick in the motion.

6. The *Viva*, lively mimoſa, or ſmalleſt ſenſitive weed, has many creeping roots, and ſpreads itſelf ſo as to cover large ſpots of ground. It riſes at moſt to two inches, has winged leaves, with numerous ſmall pinnæ. The flower is globular, of a bluiſh colour, and grows in cluſters from the axillæ: theſe are followed by little ſhort, hairy, pods, containing ſmooth ſhining ſeeds. This is the moſt ſenſible of all the mimoſas, the pudica not excepted. By running a ſtick over the plant, a perſon may write his name, and it will remain viſible for ten minutes.

7. The *Quadrivalvis*, perennial, or quadrivalve humble

mimoſa, has herbaceous, ſlender, quadrangular, prickly ſtems, branching and ſpreading all around, armed with recurved ſpines; bipinnated leaves of two or three pair of winged lobes, having each many pinnæ; and at the axillas globular heads of purple flowers, ſucceeded by quadrivalvular pods. This is of the humble ſenſitive kind, both leaves and footſtalks receding from the touch.

8. The *Plena*, annual, or double-flowered ſenſitive mimoſa, riſes with an herbaceous, erect, round, unarmed ſtem, cloſely branching and ſpreading every way, three or four feet high; bipinnated leaves of four or five pair of winged lobes, of many pairs of pinnæ; and at the axillas and termination of the branches ſpikes of yellow pentandrous flowers, the lower ones double; ſucceeded by ſhort broad pods. This annual is only ſenſative in the foliola, but extremely ſenſible of the touch or air.

9. The *Cornigera*, or horned Mexican mimoſa, commonly called *great horned acacia*, has a ſhrubby upright, deformed ſtem, branching irregularly, armed with very large, horn-like white ſpines, by pairs, connated at the baſe; bipinnated leaves thinly placed; and flowers growing in ſpikes. This ſpecies is eſteemed a curioſity for the oddity of its large ſpines, reſembling the horns of animals, and which are often variouſly wreathed, twiſted, and contorted.

10. The *Farneſiana*, or fragrant acacia, grows in woodlands and waſte lands in moſt parts of Jamaica; riſing to 25 or 30 feet, with ſuitable thickneſs. The bark of the trunk is brown and ſcaly, the branches are alternate. It is adorned with bipinnated leaves of a bright green colour; and yellow globular flowers from the axillæ, of a fragrant ſmell. The pods are about three inches long, and half an inch broad; they are of a light brown colour, ſmooth, compreſſed, and contain five or ſix ſmooth flat ſeeds. Formerly the flowers of this tree were uſed as an ingredient in the *theriaca andromachi* of the old diſpenſatories. The tree is ſometimes planted for a hedge or fence round incloſures: and the timber, though ſmall, is uſeful in rural economy.

11. The *Arborea*, or wild tamarind tree, is common in all the woodlands, and eſpecially near where ſettlements have been made, in Jamaica. It riſes to a conſiderable height, and is proportionally thick. The timber is excellent, and ſerves many purpoſes in rural economy: it is of the colour of cedar, pretty hard and takes a good poliſh. The leaves are numerous; the flowers globular and white. The pods are about a foot in length, of a fine ſcarlet colour: when they are ripe they open and become twiſted. The ſeeds then appear; they are oblong, ſmooth, of a ſhining black, and quite ſoft. On the whole, from the leaves, flowers, and pods, this tree exhibits a ſingular and beautiful contraſt. With us this plant is raiſed in hot-houſes; but it appears, that with a little pains it may be made to grow in the open air. A good ſizeable tree of this ſort grew in the garden of the late Dr William Pitcairn, at Iſlington, near London.

12. The *Latifolia*, ſhag-bark, or white wild tamarind. This excellent timber tree is very common in Jamaica, and riſes to a moderate height and good thickneſs. The trunk is rough and ſcaly: The leaves are numerous, of a rhomboidal figure, and yellowiſh caſt. The flower-ſpikes are from the axillæ; their colour is yellow. The ſeed-veſſels are flat, jointed, and twiſted. The ſeeds are of the bigneſs of a vetch, white, and finely ſtreaked with blue.

Of this tree there is a variety which ſome botaniſts call *M. ſerpentina*. The chief difference is in the leaves, which are ſmaller, and of a ſhining dark green.

13. The *Ebenus*, or ebony tree. This is a native of the Eaſt Indies but raiſed from ſeeds in Jamaica and St Vincent's. It is figured, though not accurately, by Plukenet, Tab. 331. fig. 1. To what height this tree grows, we cannot yet ſay: but it muſt be of a conſiderable thickneſs if it be the ebony we have in uſe here. Time will ſoon determine this, as the few plants in the iſlands are reared with great care by Dr Dancer in Jamaica and Mr Alexander Anderſon in St Vincent's.

Plate CCCXI. fig. 4.

14. 15. The *Cinerea* α;—β *Pinnata?* Caſhaw buſhes. Theſe ſpecies are common about Kingſton and Spaniſh town Jamaica, and riſe by ſlender trunks to about 20 feet.

Dr Roxburgh of Madraſs, amongſt a number of uſeful diſcoveries, has found the lac inſect on this ſpecies of mimoſa *. We have ſeen the native gum-lac on one of the ſmall twigs, and a ſpecimen of the plant in the collection of a gentleman here. The plant is a variety of the cinerea, and appears rather to be the *M. pinnata*, Lin. It is to be hoped, that in a ſhort time the uſeful inſect juſt mentioned may be tranſported from Aſia to the Weſt Indies, where this gum, or rather wax, may be alſo produced.

16. The *Scandens*, cacoons, or maſootoo wyth (*Gigalobium ſcandens*, Browne's Jam. p. 362. *Phaſeolus maximus perennis*, Sloane's Cat. 68. *Perin Kaku-valli*, H. M. viii. T. 32, 3, 4.) This ſpecies of mimoſa is frequent in all the upland valleys and woodlands on the north ſide of Jamaica. It climbs up the talleſt trees, and ſpreads itſelf in every direction by means of its *cirrhi* or claſpers, ſo as to form a complete arbour, and to cover the ſpace of an Engliſh acre from one root. This circumſtance has a bad effect on the trees or buſhes ſo ſhaded. Light, air, and rain (ſo neceſſary for all plants), being ſhut out, the leaves drop off, the tree gradually rots, and the limbs fall down by the weight of this paraſite.

Several authors have mentioned the cacoon; but their deſcriptions of the plant, and particularly the figures, are erroneous. On that account we have given a figure from the herbarium of a gentleman long reſident in Jamaica: and the following are the characters, transcribed from his field notes.

Fig 3.

Folio conjugata, *Petioli* communis longi oppoſiti *cirrho* terminali. *Pinnæ* quadrijugæ vel duodecim jugæ, oblongæ apice obtuſæ nitidæ utrinquæ glabræ. *Cirrhus* longus contortus apice bifidus. *Spicæ* axillares erectæ, longiſſimæ, multifloræ floribus parvis, colore viride flavo. *Calyx* quinquedentatus minimus. *Corolla* pentapetala, erecta, parva. *Filamenta* numeroſa, e baſi corollæ, et eodem longitudine. Antheræ globoſæ erectæ. *Stylus* filiformis, tortus, longitudine ſtaminum. *Stigma* ſimplex. Legumen maximum, lignoſum durum, 5 vel 8-pedale longum et 4-5 unciarum latitudine, varie contortum, compreſſum, bivalve.

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* See Aſiatic Reſearches Vol. I.

Semina plura, circiter decem vel quindecim numero, orbiculata, ſubcompreſſa, cortice duro, nitido-fuſco, *Hilo* nigro breve.

The roots of this plant run ſuperficially under the ground or herbage. The trunk is ſeldom thicker than a man's thigh, and ſends off many branches, with numerous ſhining green leaves, each of which terminates in a tendril or claſper, that ſerves to faſten it to trees or buſhes. The flower-ſpikes are from the axillæ: they are ſlender, and the florets on them ſmall and numerous. The pod is perhaps the largeſt and longeſt of any other in the world; being ſometimes eight or nine feet in length, five inches broad, jointed, and containing 10 or 15 ſeeds. Theſe ſeeds are brown, ſhining, flattened, and very hard, and called *cacoons*. They are the ſame mentioned in the Philoſophical Tranſactions, n° 222. page 298. by Sir Hans Sloane, as being thrown aſhore on the Hebrides and Orkneys. This happens in the following manner: The ſeeds or beans fall into the rivers, and are conveyed to the ſea. The trade-winds carries them weſtward till they fall into the gulf ſtream, which forces them northward along the coaſt of America and the Bahama iſlands. As the winds blow frequent and ſtrong from America, theſe ſeeds are driven to the eaſtward, till at length they are thrown aſhore and left with the tide as aforeſaid.

This bean, after being long ſoaked in water, is boiled and eaten by ſome negroes; but, in general, there ſeems to be no other uſe made of it than as a ſort of ſnuff-box.

17. The *Catechu*, according to Mr Ker†, grows only to 12 feet in height, and to one foot in diameter; it is covered with a thick rough brown bark, and towards the top divides into many cloſe branches: the leaves are bipinnated, or doubly winged, and are placed alternately upon the younger branches: the partial pinnæ are nearly two inches long, and are commonly from 15 to 30 pair, having ſmall glands inſerted between the pinnæ: each wing is uſually furniſhed with about 40 pair of pinnulæ or linear lobes, beſet with ſhort hairs: the ſpines are ſhort, recurved, and placed in pairs at the baſes of each leaf: the flowers are hermaphrodite and male, and ſtand in cloſe ſpikes, which ariſe from the axillæ of the leaves, and are four or five inches long: the calyx is tubular, hairy, and divides at the limb into five oval pointed ſegments: the corolla is monopetalous, whitiſh, and of the ſame form as the calyx, but twice its length: the filaments are numerous, capillary, double the length of the corolla, adhering at the baſe of the germen, and crowned with roundiſh antheræ: the germen is oval, and ſupports a ſlender ſtyle, which is of the length of the filaments, and terminated by a ſimple ſtigma: the fruit, or pod, is lance-ſhaped, brown, ſmooth, compreſſed, with an undulated thin margin; it contains ſix or eight roundiſh flattened ſeeds which produce a nauſeous odour when chewed. From this tree, which grows plentifully on the mountainous parts of Indoſtan, where it flowers in June, is produced the officinal drug long known in Europe by the name of *terra japonica*; for the hiſtory and preparation of which, ſee the article *Terra Japonica*.

Plate CCCXI. fig. 2.

18. The *Nilotica*, or true Egyptian acacia, riſes to a greater height than the preceding: the bark of the trunk is ſmooth, and of a grey colour; that of the branches has commonly a purpliſh tinge: the leaves are bipinnated, and placed alternately: the partial pinnæ are oppoſite, furniſhed with a ſmall gland between the outermoſt pair, and beſet with numerous pairs of narrow elliptical pinnulæ, or leafits: the ſpines are long, white, ſpreading, and proceed from each ſide of the baſe of the leaves: the flowers are hermaphrodite and male; they aſſume a globular ſhape, and ſtand four or five together upon ſlender peduncles, which ariſe from the axillæ of the leaves: the calyx is ſmall, bell-ſhaped, and divided at the mouth into five minute teeth: the corolla conſiſts of five narrow yellowiſh ſegments; the filaments are numerous, capillary, and furniſhed with roundiſh yellow antheræ: the germen is conical, and ſupports a ſlender ſtyle, crowned with a ſimple ſtigma: the fruit is a long pod, reſembling that of the lupin, and contains many flattiſh brown ſeeds. It is a native of Arabia and Egypt, and flowers in July.

Plate CCCXI. fig. 1.

Although the mimoſa nilotica grows in great abundance over the vaſt extent of Africa, yet gum arabic is produced chiefly by thoſe trees, which are ſituated near the equatorial regions; and we are told, that in Lower Egypt the ſolar heat is never ſufficiently intenſe for this purpoſe. The gum exſudes in a liquid ſtate from the bark of the trunk and branches of the tree, in a ſimilar manner to the gum which is often produced upon the cherry-trees, &c. in this country; and by expoſure to the air it ſoon acquires ſolidity and hardneſs. In Senegal the gum begins to flow when the tree firſt opens its flowers; and continues during the rainy ſeaſon till the month of December, when it is collected for the firſt time. Another collection of the gum is made in the month of March, from inciſions in the bark, which the extreme dryneſs of the air at that time is ſaid to render neceſſary. Gum arabic is now uſually imported into England from Barbary; not packed up in ſkins, which was the practice in Egypt and Arabia, but in large caſks or hogſheads. The common appearance of this gum is well known; and the various figures which it aſſumes ſeem to depend upon a variety of accidental circumſtances attending its tranſudation and concretion. Gum Arabic of a pale yellowiſh colour is moſt eſteemed; on the contrary, thoſe pieces which are large, rough, of a roundiſh figure, and of a browniſh or reddiſh hue, are found to be leſs pure, and are ſaid to be produced from a different ſpecies of mimoſa *(M. Senegal)*; but the Arabian and Egyptian gum is commonly intermixed with pieces of this kind, ſimilar to that which comes from the coaſt of Africa near the river Senegal.

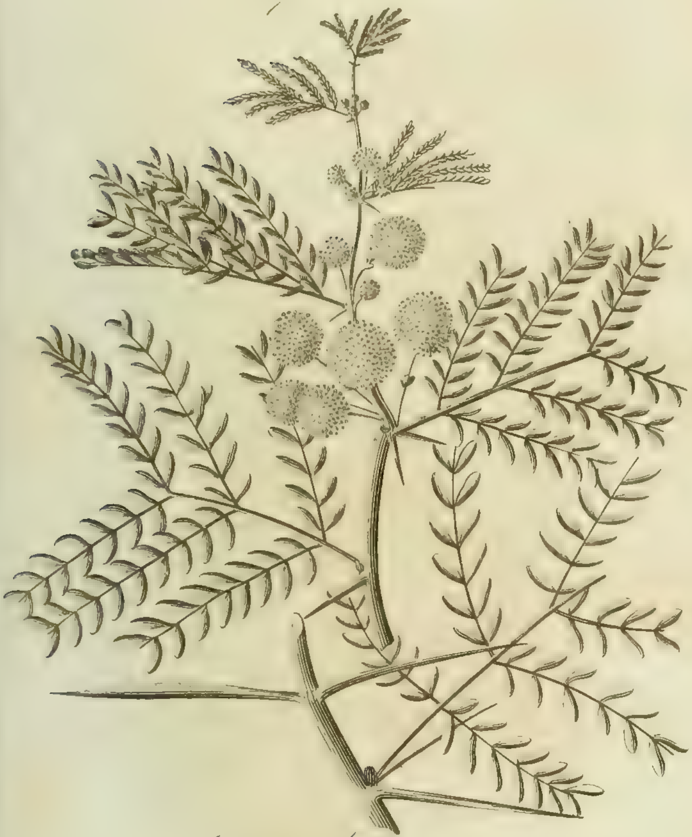
Gum-arabic does not admit of ſolution by ſpirit or oil, but in twice its quantity of water it diſſolves into a mucilaginous fluid, of the conſiſtence of a thick ſyrup; and in this ſtate anſwers many uſeful pharmaceutical purpoſes, by rendering oily, reſinous, and pinguious ſubſtances, miſcible with water. The glutinous quality of gum-arabic is preferred to moſt other gums and mucilaginous ſubſtances, as a demulcent in coughs, hoarſeneſſes, and other catarrhal affections, in order to obtund irritating acrimonious humours, and to ſupply the loſs of abraded mucus. It has been very generally employed in caſes of ardor urinæ and ſtranguary;

† Med. Ob. and Inquir. Vol. V. p. 151. &c.

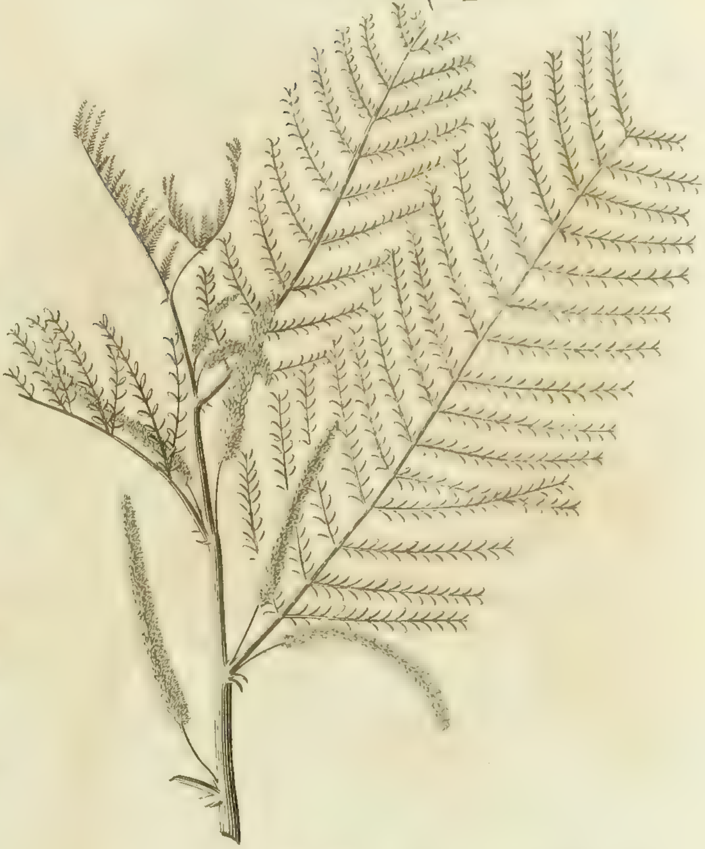
Mimosa.

Plate CCCXI

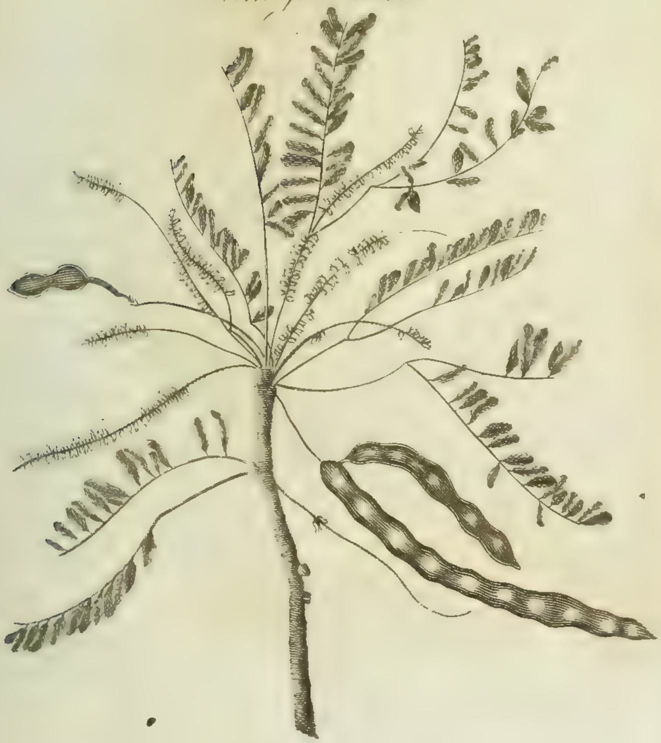
Mimoſa nilotica



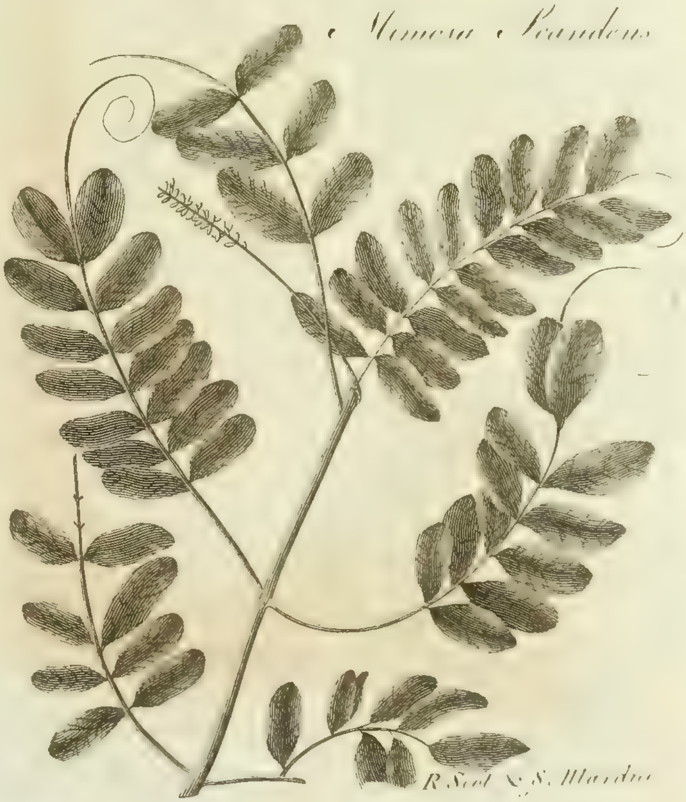
Mimosa Catechu



Mimoſa Cinerea

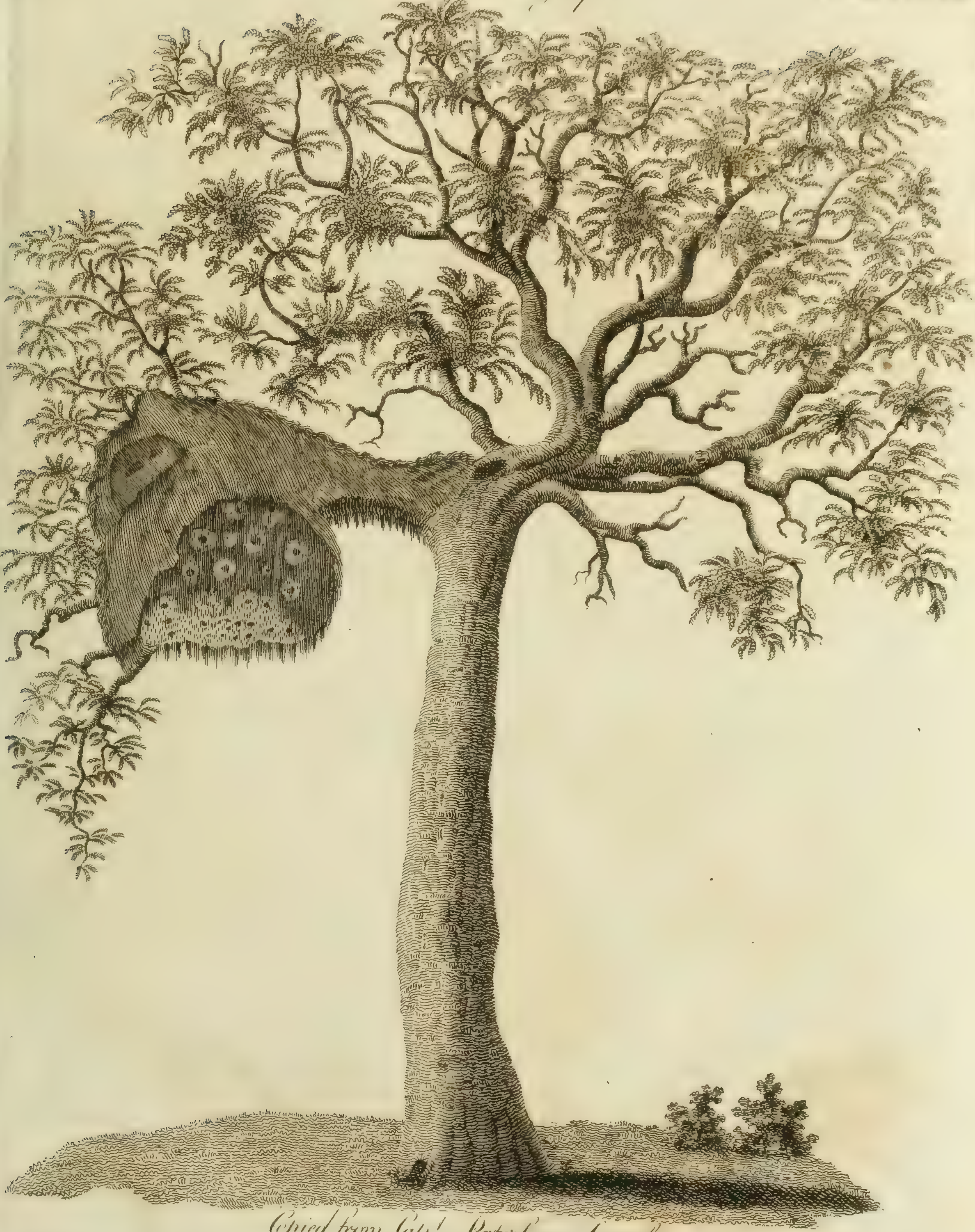


Mimosa Scandens



R. Scot & S. Allardice

Mimosa (non-descript)



Copied from Capt. Patersons Travels

R. Scot & S. Allardice

Mimoſa, Mina.

ary: but it is the opinion of Dr Cullen, "that even this mucilage, as an internal demulcent, can be of no ſervice beyond the alimentary canal." See farther the article *Gum Arabic*.

19. The *Senegal* is a native of guinea, and was ſome time ago introduced into Jamaica. Dr Wright tells us, he ſaw both this and the mimoſa nilotica, of the ſize of a cherry tree, growing at Dr Paterſon's in the pariſh of Hanover, Jamaica. The flowers are globular, yellow, and fragrant, The pods are brown, and of the ſize of a gooſe-quill. The tree, on being wounded, exſudes gum arabic, though in leſs quantity and leſs tranſparent, than that of the ſhops, which is obtained from the *nilotica* above deſcribed.

There are above 40 other ſpecies characteriſed in the *Syſtema Vegetabilium*.

On Plate CCCXII. is figured a new ſpecies, of an uncommon ſize, mentioned by Mr Paterſon in his Travels among the Hottentots, but not particularly deſcribed. Like ſeveral of the other mimoſas, it produces gum, which is conſidered by the natives as a peculiarly delicate ſpecies of food; the leaves and lower points of the branches ſeem to conſtitute the principal aliment of the camelopardalis; and, from the extent of its boughs, and the ſmoothneſs of the trunk, it affords a ſufficient defence to a ſpecies of gregarious bird againſt the tribe of ſerpents and other reptiles which would otherwiſe deſtroy its eggs. See the article Loxia.

† Travels, Vol. V. p. 34, 35.

Mr Bruce † deſcribes two plants which ſeem referable to this genus; the one named *ergett el dimmo*, the other *ergett el krone*.

The former, in our author's opinion, ſhould be named *mimoſa ſanguinea*; its name in the Abyſſinian language ſignifying *the bloody ergett*, and derived, as he ſuppoſes, from its being partly compoſed of beautiful pink filaments. When the bloſſoms are fully ſpread, the upper part of them conſiſts of yellow curled filaments, and the under part of pink filaments of a ſimilar ſhape. In its unripe ſtate, that part which afterwards becomes pink is of a green colour, and compoſed of tubercles of a larger ſize, and more detached than theſe which afterwards produce the yellow filaments; the latter being ſmaller, and cloſer ſet together: the leaves are of the double-pinnated kind.

The name of the other ſpecies, in the Abyſſinian language, ſignifies *the horned ergett*; which our author ſuppoſes to be given it on account of the figure of the pods. The flower very much reſembles that of the acacia vera in ſize and ſhape, excepting that it is attached to the branch by a ſtrong woody ſtalk of conſiderable length, which grows out at the bottom of the branch bearing the leaves, and is ſheltered as in a caſe by the lower part of it. The branches are all covered with ſhort, ſtrong, and ſharp-pointed thorns, having their points inclined backwards towards the root. The pods are covered with a prickly kind of hair, which eaſily rubs off with the fingers, ſticks to them, and gives a very uneaſy ſenſation. They have thirteen diviſions: in each of which are three hard, round, and ſhining ſeeds, of a duſky brown colour.

Both of theſe ſhrubs ſhut their leaves on the coming on of the violent rains in the wet ſeaſon, and never fully expand them till the dry ſeaſon returns.

MINA, or Maneh, a ſpecies of money, which properly ſignifies *one part* or *ounce*. It is obſerved that this word occurs only in the books of Kings, Chronicles, Ezra, and Ezekiel. This prophet (xlv. 12.) tells us, that the minah or maneh was valued at 60 ſhekels, which in gold make of our Engliſh money about 54¾ pounds, and in ſilver almoſt ſeven pounds. Thus for the Hebrew maneh. But the Greek or Attic mina, which is probably that mentioned in the books of the Maccabees and in the New Teſtament, is valued at 100 drachmæ, or about 2l. 17s. ſterling. There was alſo a leſſer mina, which was valued at 75 drachmæ.

Minagnghinim | Mindanoa.

MINAGNGHINIM, a pulſatile inſtrument of muſic, among the Hebrews, which was a ſquare table of wood, fitted with a handle; over this table was ſtretched an iron chain, or hempen, cord, paſſing thro' balls of wood or braſs, which ſtruck againſt the table when the inſtrument was ſhook, and occaſioned a clear ſound, which might be heard at a great diſtance. See Kircher's figure of it in Plate CCCXIV.

MINCHA, in the Jewiſh cuſtoms, offerings of meal, cakes, or biſcuits, made in the temple of the Lord. The Seventy have ſometimes preſerved this word in their tranſlation; but inſtead of *mincha* they read *manaa*, which doubtleſs was the received pronunciation in their time. We find *manaa* in the ſame ſenſe, in Baruch i. 10. Levit. ii. 3. &c. See the Greek of Jerem. xvii. 26. Dan. ii. 46. 2 Kings viii. 5, 9, xvii. 7. xx. 12. 2 Chron. vii. 7. Nehem. xiii. 5, 9, &c.

MINCHING-hampton, a town of Glouceſterſhire, 20 miles from Bath and Briſtol, and near 90 from London, with a market on Tueſdays, and two fairs. The pariſh is pretty large, being bounded on the north by the Stroud, and on the ſouth by the brook Avening: and has 12 hamlets belonging to it, with a common called Amberley. Here is a good large rectory church, built in form of a croſs, and worth 200l. a-year, Near it are very large camps, with deep trenches; and near Dunkirk in this pariſh are fulling mills.

MINCIUS, a river of the Tranſpadana: running from, or rather tranſmitted through, the Lacus Benacus, from north to ſouth, into the Padus; but originally riſing in the Rhetian Alps. Now Mincio or Menzo, running through the duchy of Mantua into the Po.

MIND, a thinking intelligent being, otherwiſe called *ſpirit*, in oppoſition to matter or body. See Metaphysics, Part III.

Meares's Voyages.

MINDANOA, or Magindanao, a large iſland of Aſia in the Eaſt Indies, and one of the Philippines; 160 miles in length, and 120 in breadth. The interior parts contain ſeveral chains of lofty mountains, between which are extenſive plains, where vaſt herds of cattle roam at large in the moſt delicious paſtures. Several deep valleys alſo interſect, as it were, certain parts of the country, through which, during the rainy ſeaſons, vaſt torrents pour from the mountains, and force their impetuous way to the ſea. The rains and vapours which lodge in the plains diffuſe themſelves into meandering rivulets, and, collecting a variety of ſmall ſtreams in their courſe, approach the ſea in the form of conſiderable rivers.—The ſovereign of Mindanao is a powerful prince, and has [illegible]

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acknowledge him as their head. Nevertheleſs, there are others of them who refuſe ſubmiſſion to him, and are conſequently in a continual ſtate of war: ſo that peace, at leaſt, does not appear to be one of the bleſſings of this iſland. The Spaniards, indeed aſſert their right to the entire dominion of Magindanao: but it is mere aſſertion for though they have forts, &c. on the iſland, it is by no means in a ſtate of ſubjection to their nation.

The air is eſteemed ſalubrious, particularly in the vicinity of the ſea. The heat there is not, in any degree, ſo intenſe as might be expected in a country which is ſituated on the very verge of the torrid zone The prevalence of the eaſterly winds, in that part of the coaſts which is waſhed by the Pacific Ocean, renders the air cool and pleaſant, the trade-wind blowing inceſſantly on its ſhores. It acts, indeed, with ſo much power as to ſweep the whole breadth of the iſland: and though in its paſſage it loſes much of its ſtrength, it retains a ſufficient degree of force to afford refreſhing breezes to the inhabitants of the weſtern ſhore. The inferior parts are much colder, from a very cloudy atmoſphere, which frequently hangs over the ſummits of the mountains in thick and humid vapours. The ſoil, which is very exuberant, is ſuited to the cultivation of the whole vegetable tribes. Rice is produced in the greateſt abundance; a pecul, or 133 pounds, may be purchaſed for a Spaniſh dollar. Every part of the iſland abounds with buffaloes, cows, hogs, goats, &c. It affords alſo great variety of fowls, and a ſpecies of duck, whoſe head is of a fine ſcarlet colour. Here are alſo a ſmall breed of horſes, remarkable for their ſpirit. The natives however principally employ buffaloes in the various branches of huſbandry and agriculture.

The city of Magindanao is ſituated on the ſouth-eaſt ſide of the iſland, has a river capable of admitting ſmall veſſels, and carries on a conſiderable trade with Manilla, Sooloo, Borneo, and the Moluccas. Their exports are rice, tobacco, bees-wax, and ſpices; in return for which they receive coarſe cloths of Coromandel, China ware, and opium. The village or town of Samboingan is ſituated on the banks of a ſmall rivulet, which empties itſelf immediately into the ſea, and is agreeably ſhaded by groves of cocoa-trees. The number of its inhabitants are about 1000, among which are included the officers, ſoldiers, and their reſpective families. In its envirous there are ſeveral ſmall look-out houſes, erected on poſts of twelve feet high, in all of which a conſtant guard is kept; ſo that it appears as if the Spaniards were in a continnal ſtate of enmity with the natives. The houſes are built of thoſe ſimple materials which are of very general uſe in the eaſtern ſeas. They are erected on poſts, and built of bamboo, covered with matts; the lower apartments ſerve for their hogs, cattle, and poultry, and the upper ones are occupied by the family."

MINDELHEIM, a town of Germany, in the circle of Suabia, and in Algow, with a caſtle. It is capital of a ſmall territory between the rivers Iller and Lech, ſubject to the houſe of Bavaria. It was taken by the Imperialiſts after the battle of Hockſtet, who erected it into a principality in favour of the duke of Marlborough; but it returned back to the houſe of Bavaria by the treaty of Raſtat. It is 33 miles ſouth eaſt of Ulm. E. Long. 10. 40. N. Lat. 48. 5.

Mindelheim, a diſtrict of Germany, in Suabia, lying between the biſhopric of Augſburgh and the abbacy of Kempten, which is 20 miles in length and 16 in breadth.

MINDEN, a conſiderable town of Germany in the circle of Weſtphalia; and capital of a territory of the ſame name; ſeated on the river Weſer, which renders it a trading-place. It belongs to the king of Pruſſia, who has ſecularized the biſhopric. It is 27 miles eaſt-by-ſouth of Oſnaburg, and 37 weſt of Hanover. E Long. 9. 5. N. Lat. 52. 21,

Minden (the principality of), in Germany, lies in the circle of Weſtphalia, to the north of the country of Ravenſberg, and along each ſide of the river Weſer. It is about 22 miles ſquare, and Minden and Peterſhagen are the principal places. It was formerly a biſhopric, but is now ſeculariſed; and was ceded to the elector of Brandenburg by the treaty of Weſtphalia.

MINDORA, an iſland of Aſia, in the Eaſt Indies, and one of the Philippines, 50 miles in circumference, and ſeparated from Luconia by a narrow channel. It is full of mountains, which abound in palm-trees and all ſorts of fruits. The inhabitants are idolaters, and pay tribute to the Spaniards to whom this iſland belongs.

MINE, in natural hiſtory, a deep pit under ground, from whence various kinds of minerals are dug out; but the term is more particularly applied to thoſe which yield metals. Where ſtones only are procured, the appellation of *quarries* is univerſally beſtowed upon the places from which they are dug out, however deep they may be.

The internal parts of the earth, as far as they have been yet inveſtigated, do not conſiſt of one uniform ſubſtance, but of various *ſtrata* or beds of ſubſtances, extremely different in their appearances, ſpecific gravities, and chemical qualities, from one another. Neither are theſe ſtrata ſimilar to one another either in their nature or appearance in different countries; ſo that even in the ſhort extent of half a mile, the ſtrata will be found quite different from what they are in another place. As little are they the ſame either in depth or ſolidity. Innumerable cracks and fiſſures, by the miners called *lodes*, are found in every one of them; but theſe are ſo entirely different in ſize and ſhape, that it is impoſſible to form any inference from their ſize in one place to that in another. In theſe, lodes or fiſſures the metallic ore is met with; and conſidering the great uncertainty of the dimenſions of the lodes, it is evident that the buſineſs of mining which depends on that ſize, muſt in like manner be quite uncertain and precarious. Mr Price, in his treatiſe on the Corniſh mines, obſerves, that "the comparative ſmallneſs of the largeſt fiſſures to the bulk of the whole earth is really wonderful. In the fineſt pottery we can make, by a microſcopic view, we may diſcover numerous cracks and fiſſures, ſo ſmall as to be impenetrable by any fluid, and impervious to the naked eye;" as, by the laws of nature originally impoſed by the Creator, it happens that matter cannot contract itſelf into ſolid large maſſes, without leaving fiſſures between them, and yet the very fiſſures are as neceſſary and uſeful as the ſtrata through which they paſs. They are the drains that carry off the redundant moiſture from the earth; which, but for them, would be too full of fens and bogs for animals to live or plants to thrive on. In theſe fiſſures, the ſeveral ingredients which form *lodes*, by the continual paſſing of waters, and the menſtrua of metals, are brought out of the adjacent ſtrata, collected and conveniently lodged in a narrow channel, much to the advantage of thoſe who ſearch for and purſue them; for if metals and minerals were more diſperſed, and ſcattered thinly in the body of the ſtrata, the trouble of finding and getting at them would be endleſs, and the expence of procuring them exceed the value of the acquiſition.

The inſides of the fiſſures are commonly coated over with a hard, cryſtalline, earthy ſubſtance or rind, which very often, in the breaking of hard ore, comes off along with it, and is commonly called the *capels* or *walls* of the lode: but Mr Price is of opinion, that the proper walls of the lode are the ſides of the fiſſure itſelf, and not the coat juſt mentioned, which is the natural plaſter upon thoſe walls, furniſhed perhaps by the contents of the fiſſures, or from oozings of the ſurrounding ſtrata.

The breadth of a lode is eaſily known by the diſtance betwixt the two incruſted ſides of the ſtones of ore; and if a lode yields any kind of ore, it is a better ſign that the walls be regular and ſmooth, or at leaſt that one of them be ſo, than otherwiſe; but there are not many of theſe fiſſures which have regular walls until they have been ſunk down ſome fathoms.

Thus the inner part of the fiſſure in which the ore lies, is all the way bounded by two walls of ſtone, which are generally parallel to one another, and include the breadth of the vein or lode. Whatever angle of inclination ſome fiſſures make in the ſolid ſtrata at their beginning, they generally continue to do the ſame all along. Some are very uncertain in their breadth, as they may be ſmall at their upper part and wide underneath, and *vice verſa*. Their regular breadth, as well as their depth, is ſubject to great variation; for though a fiſſure may be many fathoms wide in one particular place, yet a little further eaſt or weſt it may not perhaps be one inch wide. This exceſſive variation happens generally in very compact ſtrata, when the vein or fiſſure is ſqueezed, as it were, through hard rocks which ſeem to compreſs and ſtraiten it. A true vein or fiſſure, however, is never entirely obliterated, but always ſhows a ſtring of metallic ore or of a veiny ſubſtance; which often ſerves as a leader for the miners to follow until it ſometimes leads them to a large and richly impregnated part. Their length is in a great meaſure unlimited, though not the ſpace beſt fitted for yielding metal. The richeſt ſtate for copper, according to Mr Price, is from 40 to 80 fathoms deep; for tin, from 20 to 60; and though a great quantity of either may be raiſed at 80 or 100 fathoms, yet "the quality (ſays our author) is often too much decayed and dry for metal."

Mr Price informs us, that the fiſſures or veins of the Corniſh mines extend from eaſt to weſt; or, more properly, one end of the fiſſure points weſt and by ſouth, or weſt and by north; while the other tends eaſt and by ſouth, or eaſt and by north. Thus they frequently paſs through a conſiderable tract of country with very few variations in their directions, unleſs they be interrupted by ſome intervening cauſe.—But, beſides this eaſt and weſt-direction, we are to conſider what the miners call the *underlying* or *hade* of the vein or lode; viz. the deflection or deviation of the fiſſure from its perpendicular line, as it is followed in depth like the ſlope of the roof of a houſe, or the deſcent of the ſteep ſide of a hill. This ſlope is generally to the north or ſouth; but varies much in different veins, or ſometimes even in the ſame vein: for it will frequently ſlope or underlie a ſmall ſpace in different ways, as it may appear to be forced by hard ſtrata on either ſide.—Some of the fiſſures do not vary much from a perpendicular, while ſome deviate more than a fathom; that is, for every fathom they deſcend in perpendicular height, they deviate likewiſe as much to the ſouth or north. Others differ ſo much from the perpendicular, that they aſſume a poſition almoſt horizontal; whence they are alſo called *horizontal* or *flat lodes*, and ſometimes *lode plots*. Another kind of theſe has an irregular poſition with regard to the reſt; widening horizontally for a little way, and then deſcending perpendicularly almoſt like ſtairs, with only a ſmall ſtring or leader to follow after; and thus they alternately vary and yield ore in ſeveral flat or horizontal fiſſures. This, by the Corniſh tinners, is called (but in Mr Price's opinion erroneouſly) a *floor* or *ſquat;* which, properly ſpeaking, is a hole or chaſm impregnated with metal, making no continued line of direction or regular walls. Neither does a floor of ore deſcend to any conſiderable depth; for underneath it there appears no ſign of a vein or fiſſure, either leading directly down or any other way. This kind of vein is very rare in Britain. The fiſſures moſt common in Britain are the perpendicular and inclined, whether their direction be north or ſouth, eaſt or weſt.

The perpendicular and horizontal fiſſures (according to our author) probably remain little altered from their firſt poſition, when they were formed at the induration of the ſtrata immediately after the waters left the land. The perpendicular fiſſures are found more commonly ſituated in level ground, at a diſtance from hills, and from the ſea-ſhore; but with regard to the latter, we find that the upper and under maſſes of ſtrata differ in their ſolidity and other properties. "Hence, (ſays our author) it is very plain, that inclined fiſſures owe their deflection or underlie to ſome ſecondary cauſe, violence, or ſubſidence, of the earth: for though perpendicular fiſſures are ſeldom to be ſeen, yet ſuch as are inclined at very conſiderable depths, become more and more perpendicular as the more central ſtrata, by reaſon of the vaſt ſuperincumbent weight, do not ſeem ſo likely to be driven out of their poſition as thoſe which lie nearer the ſurface."

The fiſſures are often met with fractured as well as inclined; the reaſon of which, in Mr Price's opinion, has been a ſubſidence of the earth from ſome extraordinary cauſe. "The original poſition (ſays he) muſt have been horizontal, or parallel to the ſurface of the earth: but we often find theſe ſtrata very ſenſibly declined from that firſt poſition; nay, ſometimes quite reverſed, and changed into perpendicular. When we ſee a wall lean, we immediately conclude that the foundation has given way, according to the angles which the wall makes with the horizon; and when we find the like declination in ſtrata, we may conclude, by parity of reaſon, that there has been a like failure of what ſupported them, in proportion to that declination; or that whatever made the ſtrata to fall ſo much awry, muſt alſo cauſe every thing included in thoſe ſtrata to fall proportionably. Wherever the greateſt ſubſidence is to the north, the top of the lode or fiſſure will point to the north, and of conſequence underlie to the ſouth, and *vice verſa*: the ſlide or heave of the lode manifeſts the greater ſubſidence of the ſtrata; but the ſame lode is frequently fractured and heaved in ſeveral places: all of which, by due obſervation, will ſhow us they were occaſioned by ſo many ſeveral ſhocks or ſubſidencies, and that the ſtrata were not unfooted, ſhaken, or brought to fall once only or twice, but ſeveral times."

Mr Price, in the courſe of his work, obſerves, that though the metallic veins generally run from eaſt to weſt, they are frequently interſected by veins or *lodes*, as he calls them, of other matters, which run from north to ſouth. Some of theſe croſs veins contain lead or antimony, but never tin or copper. Sometimes one of theſe unmetallic veins interſects the true one at right angles, ſometimes obliquely; and ſometimes the mixture of both is ſo intimate, that the moſt expert miners are at a loſs to diſcover the ſeparated part of the true vein. When this laſt is intercepted at right angles, it is moved, either north or ſouth, a very little way, perhaps not more than one fathom; in which caſe, the miners having worked to a ſmall diſtance in one of theſe directions, if they find themſelves diſappointed, turn to the other hand, and ſeldom fail of meeting with what they expected. Sometimes they are directed in their ſearch by the pointing of a rib or ſtring of the true vein; but when the interruption happens in an oblique direction, the difficulty of finding the vein again is much greater.

When two metallic veins in the neighbourhood of each other run in an oblique direction, and of conſequence meet together, they commonly produce a body of ore at the place where they interſect; and if both are rich, the quantity will be conſiderable; but if one be poor and the other rich, then both are either enriched or impoveriſhed by the meeting. After ſome time they ſeparate again, and each will continue its former direction near to the other; but ſometimes, though rarely, they continue united.

It is a ſign of a poor vein when it ſeparates or diverges into ſtrings; but, on the contrary, when ſeveral of them are found running into one, it is accounted a promiſing ſign. Sometimes there are branches without the walls of the vein in the adjacent ſtrata, which often come either obliquely or tranſverſely into it. If theſe branches are impregnated with ore, or if they underlie faſter than the true vein, that is, if they dip deeper into the ground, then they are ſaid to overtake or come into the lode, and to enrich it; or if they do not, then they are ſaid to go off from it, and to impoveriſh it. But neither theſe nor any other marks either of the richneſs or poverty of a mine are to be entirely depended upon: for many mines, which have a very bad appearance at firſt, do nevertheleſs turn out extremely well afterwards; while others, which in the beginning ſeemed very rich, turn gradually worſe and worſe: but in general, where a vein has a bad appearance at firſt, it will be imprudent to be at much expence with it.

Veins of metal, as has been already obſerved, are frequently, as it were, ſo compreſſed betwixt hard ſtrata, that they are not an inch wide; nevertheleſs, if they have a ſtring of good ore, it will generally be worth while to purſue them; and they frequently turn out well at laſt, after they have come into ſofter ground. In like manner, it is an encouragement to go on if the branches or leaders of ore enlarge either in width or depth as they are worked; but it is a bad ſign if they continue horizontal without inclining downwards; though it is not proper always to diſcontinue the working of a vein which has an unfavourable aſpect at firſt. Veins of tin are worth working when only three inches wide, provided the ore be good; and copper ores when ſix inches wide will pay very well for the working. Some of the great mines, however, have very large veins, with a number of other ſmall ones very near each other. There are alſo veins croſſing one another ſometimes met with, which are called *contras*, vulgarly *caunters*. Sometimes two veins run down into the ground in ſuch a manner that they meet in the direction of their depth; in which caſe, the ſame obſervations apply to them which are applicable to thoſe that meet in an horizontal direction. Sometimes a vein will ſuddenly diſappear without giving any warning, by becoming narrower, or of worſe quality; which by the miners is called a *ſtart* or *leap*, and is very common in the mines of Cornwall. In one day's time they may thus be diſappointed in the working of a rich vein of tin, and have no further ſign of any thing to work upon: at the fractured extremity of their vein they perceive a body of clay or other matter; and the method of recovering their vein is to drive on their work in the direction of the former part, ſo that their new work ſhall make the ſame angle with the clay that the other part of the vein does. Sometimes they ſink a ſhaft down from the ſurface; but it is generally a matter of difficulty to recover a vein when thus loſt.

The method of diſcovering mines is a matter of ſo much difficulty, that it ſeems ſurpriſing how thoſe who were totally unacquainted with the nature of metals firſt came to think of digging them out of the earth. According to Lucretius, the diſcovery was made by the conflagration of certain woods, which melted the veins of metal in the earth beneath them: but this ſeems to be rather improbable. Ariſtotle, however, is of the ſame opinion with Lucretius, and tells us, that ſome ſhepherds in Spain having ſet fire to the woods, the earth was thus heated to ſuch a degree, that the ſilver near the ſurface of it melted and flowed into a maſs; and that in a ſhort time the metallic maſs was diſcovered by the rending of the earth in the time of an earthquake: and the ſame ſtory is told by Strabo, who aſcribes the diſcovery of the mines of Andaluſia to this accident. Cadmus is ſaid by ſome to have been the firſt who diſcovered gold: while others aſcribe this to Thoas the Thracian, to Mercury the ſon of Jupiter, or to Piſus king of Italy; who having left his own country, went into Egypt, where he was elected king after the death of Mizraim the ſon of Ham; and, on account of his diſcovery, was called the *Golden God*. Others ſay, that *Eaclis* or Cæacus the ſon of Jupiter, or Sol the ſon of Oceanus, was the firſt diſcoverer; but Æſchylus attributes the diſcovery not only of gold, but of all other metals, to Prometheus. The braſs and copper mines in Cyprus were firſt diſcovered by Cinyra the ſon of Agryopa; and Heſiod aſcribes the diſcovery of the iron mines of Crete to the Cretan Dactyli Idæi. The extraction of lead or tin from its ore in the iſland of Caſſiteris, according to ſeveral ancient authors, was diſcovered by Midacritus.—The ſcripture, however, aſcribes the invention of braſs and iron, or at leaſt of the methods of working them, to Tubal Cain before the flood.

In more modern times, we know that mines have been frequently diſcovered by accident; as in ſea-cliffs, among broken craggy rocks, by the waſhing of the tides or floods, alſo by irruptions and torrents of water iſſuing out of hills and mountains, and ſometimes by the wearing of high roads. Mr Price mentions another way by which mines have been diſcovered, *viz.* by fiery coruſcations; which, he ſays, he has heard from perſons whoſe veracity he is unwilling to queſtion. "The tinners (ſays he) generally compare theſe effluvia to blazing ſtars or other whimſical likeneſſes, as their fears or hopes ſuggeſt; and ſearch with uncommon eagerneſs the ground over which theſe jack-a-lanterns have appeared and pointed out. We have heard but little of theſe phenomena for many years; whether it be, that the preſent age is leſs credulous than the foregoing, or that the ground being more perforated by innumerable new pits ſunk every year, ſome of which, by the ſtannary laws, are prevented from being filled up, has given theſe vapours a more gradual vent, it is not neceſſary to enquire as the fact itſelf is not generally believed."

Mines, however, are now moſt commonly diſcovered by inveſtigating the nature of ſuch veins, ores, and ſtones, as may ſeem moſt likely to turn to account; but there is a particular ſagacity, or habit of judging from particular ſigns, which can be acquired only by long practice. Mines, eſpecially thoſe of copper, may alſo be diſcovered by the harſh and diſagreeable taſte of the waters which iſſue from them; though it is probable that this only happens when the ore lies above the level of the water which breaks out; for it does not ſeem likely that the taſte of the ore could *aſcend*, unleſs we were to ſuppoſe a pond or lake of water ſtanding above it. The preſence of copper in any water is eaſily diſcovered by immerging in it a bit of poliſhed iron, which will thus inſtantly be turned of a copper colour, by reaſon of the precipitation of the metal upon it. A candle, or piece of tallow put into water of this kind, will in a ſhort time be tinged of a green colour.

Another and ſtill more remarkable method of diſcovering mines is ſaid to be by the *virgula divinatoria*, or "divining rod;" which, however incredible the ſtories related concerning it may be, is ſtill relied on by ſome, and among others by Mr Price. It is not known who was the inventor of this method; but Agricola ſuppoſes that it took its riſe from the magicians, who pretended to diſcover mines by inchantment. No mention is made of it, however, before the 11th century, ſince which time it has been in frequent uſe; and the Corpuſcular Philoſophy has even been called in to account for it. But before we pretend to account for phenomena ſo very extraordinary as thoſe reported of the *virgula divinatoria*, it is neceſſary, in the firſt place, to determine whether or not they exiſt. Mr Price as has been already hinted, believes in it, though he owns that by reaſon of his conſtitution of mind and body he is almoſt incapable of co-operating with its influence. The following account, however, he gives from Mr William Cookworthy of Plymouth, a gentleman of known veracity and great chemical abilities.

He had the firſt information concerning this rod from one Captain Ribeira, who deſerted from the Spaniſh ſervice in Queen Anne's reign, and became captain-commandant in the garriſon of Plymouth; in which town he ſatisfied ſeveral intelligent perſons of the virtues of the rod, by many experiments on pieces of metal hid in the earth, and by an actual diſcovery of a copper mine near Oakhampton, which was wrought for ſome years. This captain very readily ſhowed the method of uſing the rod in general, but would not by any means diſcover the ſecret of diſtinguiſhing the different metals by it; though, by a conſtant attention to his practiſe, Mr Cookworthy diſcovered it. Captain Ribeira was of opinion, that the only proper rods for this purpoſe were thoſe cut from the nut or fruit-trees; and that the virtue was confined to certain perſons, and thoſe comparatively ſpeaking but few: but Mr Price ſays that the virtue reſides in all perſons and in all rods under certain circumſtances. "The rod (ſays he) is attracted by all the metals, by coals, limeſtone, and ſprings of water, in the following order: 1. Gold; 2. Copper; 3. Iron; 4. Silver; 5. Tin; 6. Lead; 7. Coals; 8. Limeſtone and ſprings of water. One method of determining the different attractions of the rod is this; Stand, holding the rod with one foot advanced; put a guinea under that foot, and an halfpenny under the other, and the rod will be drawn down; ſhift the pieces of money, and the rod will be drawn towards the face, or backwards to the gold, which proves the gold to have the ſtronger attraction.

"The rods formerly uſed were ſhoots of one year's growth that grew forked; but it is found, that two ſeparate ſhoots tied together with packthread or other vegetable ſubſtance anſwer rather better than ſuch as are naturally forked, as the ſhoots of the latter are ſeldom of an equal ſize. They are to be tied together by the greater ends, the ſmall ones being held in the hands. Hazle rods cut in the winter, ſuch as are uſed for fiſhing rods, and kept till they are dry, do beſt: though, where theſe are not at hand, apple-tree ſuckers, rods from peach trees, currants, or the oak, though green, will anſwer tolerably well."

Our author next proceeds to deſcribe the manner of holding the rod; of which he gives a figure, as he ſays it is difficult to be deſcribed. The ſmall ends being crooked, are to be held in the hands in a poſition flat or parallel to the horizon, and the upper part in an elevation not perpendicular to it, but at an angle of about 70 degrees. "The rod (ſays he) being properperly held by thoſe with whom it will anſwer, when the toe of the right foot is within the ſemidiameter of the piece of metal or other ſubject of the rod, it will be repelled towards the face, and continue to be ſo while the foot is kept from touching or being directly over the ſubject; in which caſe it will be ſenſibly and ſtrongly attracted, and be drawn quite down. The rod ſhould be firmly and ſteadily graſped; for if, when it has begun to be attracted, there be the leaſt imaginable jerk or oppoſition to its attraction, it will not move any more till the hands are opened, and a freſh graſp taken. The ſtronger the graſp the livelier the rod moves, provided the graſp be ſteady and of an equal ſtrength. This obſervation is very neceſſary; as the operation of the rod in many hands is defeated purely by a jerk or counteraction: and it is from thence concluded, that there is no real efficacy in the rod, or that the perſon who holds it wants the virtue: whereas, by a proper attention to this circumſtance in uſing it, five perſons in ſix have the virtue, as it is called; that is, the nut or fruit-bearing rod will anſwer in their hands. If a rod, or the leaſt piece of one of the nut-bearing or fruit kind, be put under the arm, it will totally deſtroy the operation of the *virgula divinatoria*, in regard to all the ſubjects of it, except water, in thoſe hands in which the rod naturally operates. If the leaſt animal thread, as ſilk, or worſted, or hair, be tied round or fixed on the top of the rod, it will in like manner hinder its operation; but the ſame rod placed under the arm, or the ſame animal ſubſtances tied round or fixed on the top of the rod, will make it work in thoſe hands, in which without theſe additions it is not attracted."

Such are the accounts of this extraordinary rod, to which it is probable that few will aſſent; and we believe the inſtances of mines having been diſcovered by it are but very rare. Another and very ancient mode of diſcovering mines, leſs uncertain than the divining rod, but extremely difficult and precarious, is that called *ſhoding*; that is, tracing them by looſe ſtones, fragments, or *ſhodes*, which may have been ſeparated and carried off to a conſiderable diſtance from the vein, and are found by chance in running waters, on the ſuperfices of the ground, or a little under. "When the tinners (ſays Mr Price) meet with a looſe ſingle ſtone of tin ore, either in a valley or in ploughing or hedging, though at 100 fathoms diſtance from the vein it came from, thoſe who are accuſtomed to this work will not fail to find it out. They conſider, that a metallic ſtone muſt originally have appertained to ſome vein, from which it was ſevered and caſt at a diſtance by ſome violent means. The deluge, they ſuppoſe, moved moſt of the looſe earthy coat of the globe, and in many places waſhed it off from the upper towards the lower grounds, with ſuch a force, that moſt of the backs or lodes of veins which protruded themſelves above the faſt were hurried downwards with the common maſs: whence the ſkill in this part of their buſineſs lies much in directing their meaſures according to the ſituation of the ſurface." Afterwards, however, our author complains, that this art of *ſhoding*, as he calls it, is in a great meaſure loſt.

The following account of a method of finding ſilver mines by Alonzo Barba ſeems to be ſimilar to that of ſhoding juſt now mentioned. "The veins of metal (ſays he) are ſometimes found by great ſtones above ground; and if the veins be covered, they hunt them out after this manner; *viz.* taking in their hands a ſort of mattock, which has a ſteel point at one end to dig with, and a blunt head at the other wherewith to break ſtones, they go to the hollows of the mountains, where the current of rain-water deſcends, or to ſome other part of the ſkirts of the mountains, and there obſerve what ſtones they meet with, breaking in pieces thoſe that ſeem to have any metal in them; whereof they find many times both middling ſort of ſtones and ſmall ones alſo of metal. Then they conſider the ſituation of that place, and whence theſe ſtones can tumble, which of neceſſity muſt be from higher ground, and follow the tract of them up the hill as long as they can find any of them," &c.

"Another way (ſays Mr Price) of diſcovering lodes is by working drifts acroſs the *country*, as we call it, that is, from north to ſouth, and *vice verſa.* I tried the experiment in an adventure under my management, where I drove all open at graſs about two feet in the ſhelf, very much like a level to convey water upon a mill wheel: by ſo doing I was ſure of cutting all lodes in my way; and did accordingly diſcover five courſes, one of which has produced above 180 tons of copper ore, but the others were never wrought upon. This method of diſcovering lodes is equally cheap and certain; for 100 fathoms in ſhallow ground may be driven at 50 s. expence.

In that kind of ground called by our author *feaſible*, and which he explains by the phraſe *tenderſtanding*, he tells us, that "a very effectual, proving, and conſequential way is, by driving an adit from the loweſt ground, either north or ſouth; whereby there is a certainty to cut all lodes at 20, 30, or 40 fathoms deep, if the level admits of it. In driving adits or levels acroſs, north or ſouth, to unwater mines already found, there are many freſh veins diſcovered, which frequently prove better than thoſe they were driving to."

After the mine is found, the next thing to be conſidered is, whether it may be dug to advantage. In order to determine this, we are duly to weigh the nature of the place, and its ſituation, as to wood, water, carriage, healthineſs, and the like; and compare the reſult with the richneſs of the ore, the charge of digging, ſtamping, waſhing, and ſmelting.

Particularly the form and ſituation of the ſpot ſhould be well conſidered. A mine muſt either happen, 1. In a mountain; 2. In a hill; 3. In a valley; or, 4. In a flat. But mountains and hills are dug with much greater eaſe and convenience, chiefly becauſe the drains and burrows, that is, the adits or avenues, may be here readily cut, both to drain the water and to form gang-ways for bringing out the lead, &c. In all the four caſes, we are to look out for the veins which the rains or other accidental thing may have laid bare; and if ſuch a vein be found, it may often be proper to open the mine at that place, eſpecially if the vein prove tolerably large and rich: otherwiſe the moſt commodious place for ſituation is to be choſen for the purpoſe, *viz.* neither on a flat, nor on the tops of mountains, but on the ſides. The beſt ſituation for a mine, is a mountainous, woody, wholeſome ſpot; of a ſafe eaſy aſcent, and bordering on a navigable river.

The places abounding with mines are generally healthy, as ſtanding high, and every where expoſed to the air; yet ſome places where mines are found prove poiſonous, and can upon no account be dug, though ever ſo rich: the way of examining a ſuſpected place of this kind, is to make experiments upon brutes, by expoſing them to the effluvia or exhalations to find the effects.

Devonſhire and Cornwall, where there are a great many mines of copper and tin, is a very mountainous country, which gives an opportunity in many places to make adits or ſubterraneous drains to ſome valley at a diſtance, by which to carry off the water from the mine, which otherwiſe would drown them out from getting the ore. Theſe adits are ſometimes carried a mile or two, and dug at a vaſt expence, as from 2000 l. to 4000 l. eſpecially where the ground is rocky; and yet they find this cheaper than to draw up the water out of the mine quite to the top, when the water runs in plenty and the mine is deep. Sometimes, indeed, they cannot find a level near enough to which an adit may be carried from the very bottom of the mine; yet they find it worth while to make an adit at half the height to which the water is to be raiſed, thereby ſaving half the expence.

The late Mr Coſtar, conſidering that ſometimes from ſmall ſtreams, and ſometimes from little ſprings or collections of rain-water, one might have a good deal of water above ground, though not a ſufficient quantity to turn an overſhot-wheel, thought, that if a ſufficient fall might be had, this collection of water might be made uſeful in raiſing the water in a mine to the adit, where it may be carried off.

But now the moſt general method of draining mines is by the ſteam-engine. See *Steam-Engine*.

Mine, in the military art, denotes a ſubterraneous canal or paſſage, dug under the wall or rampart of a fortification, intended to be blown up by gunpowder.

The alley or paſſage of a mine is commonly about four feet ſquare; at the end of this is the chamber of the mine, which is a cavity of about five feet in width and in length, and about ſix feet in height; and here the gunpowder is ſtowed. The sauciſſe of the mine is the train, for which there is always a little aperture left.

Two ounces of powder have been found, by experiment, capable of raiſing two cubic feet of earth; conſequently 200 ounces, that is, 12 pound 8 ounces, will raiſe 200 cubic feet, which is only 16 feet ſhort of a cubic toiſe, becauſe 200 ounces joined together have proportionably a greater force than 2 ounces, as being an united force.

All the turnings a miner uſes to carry on his mines, and through which he conducts the sauciſſe, ſhould be well filled with earth and dung; and the maſonry in proportion to the earth to be blown up, as 3 to 2. The entrance of the chamber of the mine ought to be firmly ſhut with thick planks, in the form of a St Andrew's croſs, ſo that the incloſure be ſecure, and the void ſpaces ſhut up with dung or tempered earth. If a gallery be made below or on the ſide of the chamber, it muſt abſolutely be filled up with the ſtrongeſt maſonry, half as long again as the height of the earth; for this gallery will not only burſt, but likewiſe obſtruct the effect of the mine. The powder ſhould always be kept in ſacks, which are opened when the mine is charged, and ſome of the powder ſtrewed about: the greater the quantity of earth to be raiſed is, the greater is the effect of the mine, ſuppoſing it to have the due proportion of powder. Powder has the ſame effect upon maſonry as upon earth, that is, it will proportionably raiſe either with the ſame velocity.

The branches which are carried into the ſolidity of walls do not exceed three feet in depth, and two feet ſix inches in width nearly: this ſort of mine is moſt excellent to blow up the ſtrongeſt walls.

The weight of a cubic foot of powder ſhould be 80 lb. 1 foot 1 inch cube will weigh 100 lb. and 1 foot 2 inches and $\frac{1}{12}$, 150 lb. and 200 lb. of powder will be 1 foot 5 inches cube; however, there is a diverſity in this, according to the quantity of ſaltpetre in the gunpowder.

If, when the mines are made, water be found at the bottom of the chamber, planks are laid there, on which the powder is placed either in ſacks or barrels of 100 lb. each. The sauciſſe muſt have a clear paſſage to the powder, and be laid in an auget or wooden trough, through all the branches. When the powder is placed in the chamber, the planks are laid to cover it, and others again acroſs theſe; then one is placed over the top of the chamber, which is ſhaped for that purpoſe: between that and thoſe which cover the powder, props are placed, which ſhore it up; ſome inclining towards the outſide, others to the inſide of the wall; all the void ſpaces being filled with earth, dung, brick, and rough ſtones. Afterwards planks are placed at the entrance of the chamber, with one acroſs the top, whereon they buttreſs three ſtrong props, whoſe other ends are likewiſe propped againſt another plank ſituated on the ſide of the earth in the branch; which props being well fixed between the planks with wedges, the branch ſhould then be filled up to its entrance with the forementioned materials. The sauciſſes which paſs through the ſide branches muſt be exactly the ſame length with that in the middle, to which they join: the part which reaches beyond the entrance of the mine is that which conveys the fire to the other three; the sauciſſes being of equal length, will ſpring together.

From a great number of experiments, it appears, 1. That the force of a mine is always towards the weakeſt ſide; ſo that the diſpoſition of the chamber of a mine does not at all contribute to determine this effect. 2. That the quantity of powder muſt be greater or leſs, in proportion to the greater or leſs weight of the bodies to be raiſed, and to their greater or leſs coheſion; ſo that you are to allow for each cubic fathom

Of looſe earth, - -	9 or 10 lb.
Firm earth and ſtrong ſand,	11 or 12
Flat clayey earth, -	15 or 16
New maſonry, not ſtrongly bound,	15 or 20
Old maſonry, well bound,	25 or 30

3. That the aperture, or entonnoir of a mine, if rightly charged, is a cone, the diameter of whoſe baſe is double the height taken from the centre of the mine. 4. That when the mine has been overcharged, its entonnoir is nearly cylindrical, the diameter of the upper

extreme not much exceeding that of the chamber. 5. That beſides the ſhock of the powder againſt the bodies it takes up, it likewiſe cruſhes all the earth that borders upon it, both underneath and ſidewiſe.

To charge a mine ſo as to have the moſt advantageous effect, the weight of the matter to be carried muſt be known; that is, the ſolidity of a right cone, whoſe baſe is double the height of the earth over the centre of the mine: thus, having found the ſolidity of the cone in cubic fathoms, multiply the number of fathoms by the number of pounds of powder neceſſary for raiſing the matter it contains; and if the cone contains matters of different weights, take a mean weight between them all, always having a regard to their degree of coheſion.

As to the diſpoſition of mines, there is but one general rule, which is, that the ſide towards which one would determine the effect be the weakeſt; but this varies according to occaſions and circumſtances.

The calculation of mines is generally built upon this hypotheſis, that the entonnoir of a mine is the fruſtrum of an inverted cone, whoſe altitude is equal to the radius of the excavation of the mine, and the diameter of the whole leſſer baſe is equal to the line of leaſt reſiſtance; and though theſe ſuppoſitions are not quite exact, yet the calculations of mines deduced from them have proved ſucceſsful in practice; for which reaſon this calculation ſhould be followed till a better and more ſimple be found out.

M. de Valliere found that the entonnoir of a mine was a paraboloid, which is a ſolid generated by the rotation of a ſemiparabola about its axis; but as the difference between theſe two is very inſignificant in practice, that of the fruſtum of a cone may be uſed.

MINERAL, in natural hiſtory, is uſed in general for all foſſile bodies, whether ſimple or compound, dug out of a mine; from whence it takes its denomination.

Mineral Waters. All waters naturally impregnated with any heterogeneous matter which they have diſſolved within the earth may be called *mineral-waters*, in the moſt general and extenſive meaning of that name; in which are therefore comprehended almoſt all thoſe that flow within or upon the ſurface of the earth, for almoſt all theſe contain ſome earth or ſelenites. But waters containing only earth or ſelenites are not generally called *mineral*, but *hard* or *crude waters*.

Hard waters which are ſimply ſelenetic, when tried by the chemical proofs, ſhow no marks of an acid or of an alkali, nor of any volatile, ſulphureous, or metallic matters. Waters which contain a diſengaged calcareous earth, change the colour of ſyrup of violets to a green; and thoſe that contain ſelenites, being mixed with a ſolution of mercury in nitrous acid, form a turbith mineral; and when a fixed alkali is added, they are rendered turbid, and a white ſediment is precipitated. Theſe waters alſo do not diſſolve ſoap well. From theſe circumſtances we may know, that any water which produces theſe effects is a hard, earthy, or ſelenetic water. The waters impregnated with gas are alſo hard.

Although the waters of the ſea and ſaline ſprings be not generally enumerated amongſt mineral waters, they might nevertheleſs be juſtly conſidered as ſuch: for beſides earthy and ſelenetic matters, they alſo contain a large quantity of mineral ſalts. We ſhall therefore conſider them as ſuch in this article.

Mineral waters, properly ſo called, are thoſe in which gas, or ſulphureous, ſaline, or metallic ſubſtances, are diſcovered by chemical trials. As many of theſe waters are employed ſucceſsfully in medicine, they are alſo called *medicinal waters*.

Mineral waters receive their peculiar principles by paſſing through earths containing ſalts, or pyritous ſubſtances that are in a ſtate of decompoſition. Some of theſe waters are valuable from the quantity of uſeful ſalts which they contain, particularly of common ſalt, great quantities of which are obtained from theſe waters; and others are chiefly valued for their medicinal qualities. The former kind of mineral waters is an object of manufacture, and from them is chiefly extracted that ſalt only which is moſt valuable in commerce. See Salt.

Many of thoſe waters have been accurately analyſed by able chemiſts and phyſicians. But notwithſtanding theſe attempts, we are far from having all the certainty and knowledge that might be deſired on this important ſubject; for this kind of analyſis is perhaps the moſt difficult of any in chemiſtry.—Almoſt all mineral waters contain ſeveral different ſubſtances, which being united with water may form with each other numberleſs compounds. Frequently ſome of the principles of mineral waters are in ſo ſmall quantity, that they can ſcarcely be perceived; although they may have ſome influence on the virtues of the water, and alſo on the other principles contained in the water.—The chemical operations uſed in the analyſis of mineral waters, may ſometimes occaſion eſſential changes in the ſubſtances that are to be diſcovered. And alſo, theſe waters are capable of ſuffering very conſiderable changes by motion, by reſt, and by expoſure to air.

Probably alſo the variations of the atmoſphere, ſubterranean changes, ſome ſecret junction of a new ſpring of mineral or of pure water, laſtly the exhauſtion of the minerals whence waters receive their peculiar principles, are cauſes which may occaſionally change the quality of mineral waters.

We need not therefore wonder that the reſults of analyſes of the ſame mineral waters made by different chemiſts, whoſe ſkill and accuracy are not queſtioned, ſhould be very different.

The conſequences of what we have ſaid on this ſubject are, That the examination of mineral waters is a very difficult taſk; that it ought not to be attempted but by profound and experienced chemiſts; that it requires frequent repetitions, and at different times; and laſtly, that no fixed general rules can be given concerning theſe analyſes.

As this matter cannot be thoroughly explained without entering into details connected with all the parts of chemiſtry, we ſhall here mention only the principal reſults, and the moſt eſſential rules, that have been indicated by the attempts hitherto made on this ſubject.

We may admit the diviſion or arrangement of mineral waters into certain claſſes, propoſed by ſome of the beſt chemiſts and naturaliſts.

Some of theſe waters are called *cold*, becauſe they are not naturally hotter than the atmoſphere. Some of them are even colder, eſpecially in ſummer.

Thoſe are called *hot* mineral waters, which in all ſeaſons are hotter than the air. Theſe are of various degrees of heat, and ſome of them are almoſt as hot as boiling water. In ſome mineral waters certain volatile, ſpirituous, and elaſtic principles may be perceived, by a very ſenſible piquant taſte: this principle is called the *gas* or *ſpirit* of the waters.

The waters which contain this principle are generally lighter than pure water. They ſparkle and emit bubbles, at their ſpring, but eſpecially when they are ſhaken, and poured from one veſſel into another. They ſometimes break the bottles containing them, when theſe are well corked, as fermenting wines ſometimes do. When mixed with ordinary wine, they give to it the piquancy and ſparkling quality of Champaigne wine.

This volatile principle, and all the properties of the water dependent upon it, are loſt merely by expoſure to air, or by agitation. The waters containing this principle are diſtinguiſhed by the name of *ſpirituous mineral waters*, or *acidulous waters*.

Other diviſions of mineral waters may be made relatively to ſome of their predominant principles. Hence ſome waters are called *acidulous*, *alkaline*, *martial*, *neutral*, &c.

When a mineral water is to be examined, we may obſerve the following rules:

Experiments ought to be made near the ſpring, if poſſible.

The ſituation of the ſpring, the nature of the ſoil, and the neighbouring riſing grounds, ought to be examined.

Its ſenſible qualities, as its ſmell, taſte, colour, are to be obſerved.

Its ſpecific gravity and heat are to be aſcertained by the hydroſtatical balance and the thermometer.

From the properties abovementioned of ſpirituous mineral waters, we may diſcover whether it be one of this claſs. For greater certainty we may make the following trial. Let the neck of a wet bladder be tied to the neck of a bottle containing ſome of this water. By ſhaking the water, any gas that it may contain will be diſengaged, and will ſwell the bladder. If the neck of the bladder be then tied with a ſtring above the bottle, and be cut below this ſtring, ſo as to ſeparate the bladder from the bottle, the quantity and nature of the contained gas may be further examined.

Laſtly, we muſt obſerve the changes that are ſpontaneouſly produced upon the water in cloſe and in open veſſels, and with different degrees of heat. If by theſe means any matter be cryſtallized or depoſited, it muſt be ſet apart for further examination.

Theſe preliminary experiments and obſervations will almoſt certainly indicate, more or leſs ſenſibly, ſomething concerning the nature of the water, and will point out the method to be followed in our further inquiry.

We muſt then proceed to the decompoſition of the water, either without addition, and merely by evaporation and diſtillation, or with the addition of other ſubſtances, by means of which the matters contained in the water may be precipitated and diſcovered. It is not material which of theſe two methods be firſt practiſed, but it is quite neceſſary that the one ſhould ſucceed the other. If we begin by evaporating and diſtilling, theſe operations muſt be ſometimes interrupted, that the ſeveral principles which riſe at different times of the diſtillation may be obtained and examined ſeparately, and alſo to allow the ſeveral ſalts that may be contained to cryſtallize by the evaporation and by cold.

The ſubſtances which have hitherto been met with in mineral waters are,

1. *Vitriolic acid.* This acid is ſometimes found pure and unmixed with any other ſubſtance, though more frequently joined with iron or copper. In its pure ſtate, it is moſt frequently found in the neighbourhood of volcanoes, where, in the opinion of Dr Donald Monro, it is moſt probably "diſtilled from mines of vitriol or of pyrites-ſtone, decompoſed by ſubterraneous fire." It ſeems, however, more probably to proceed from the decompoſition of ſulphur; for neither vitriol nor pyrites will at all give a pure acid. This only can be obtained from the fumes of ſulphur, which we know abound in all ſuch places. Dr Vandellius, in a book intitled *De Thermis Agri Patavini*, publiſhed in 1761, mentions a cave near to the town of Latera, about 30 miles from Viterbo, in Italy, where a clear acid water drops from the crevices of the rocks, and is collected by the country people in glazed earthen veſſels. This has a mild agreeable taſte, and is found to be a pure vitriolic acid much diluted. The cavern, however, is ſo filled with noxious vapours, that it cannot be entered without danger of ſuffocation, except in winter, or when it blows a north wind. A ſimilar native vitriolic water is mentioned by Theophilus Griſſonius, near the town of Salvena. Varenius alſo mentions a ſpring in the province of Nota in Sicily, the waters of which are ſo ſour, that the neighbouring people uſe it inſtead of vinegar. In ſome waſte coal pits, the water taſtes ſour, and effervesces with alkalies; but in all theſe the acid is mixed with much vitriol, or other matter. Dr Monro mentions acid dews collected in the Eaſt Indies: this acid he ſuppoſes to be the vitriolic, and that it probably imparts ſome acidity to waters upon which the dews fall.

2. *Nitrous* and *marine* acids are never found in waters pure, though the former is frequently found combined with calcareous earth, and the latter with foſſile alkali, calcareous earth, or magneſia.

3. *Fixed air* enters into the compoſition of all waters; but abounds particularly in thoſe of the mineral kind, at leaſt ſuch as are cold. It imparts an agreeable acidulous taſte to ſuch water as it is mixed with, and is found by undoubted experiments to be that which gives the power and efficacy to the cold kind. It is known to be a ſolvent of iron, and that by its means this metal is very often ſuſpended in waters; and Dr Dejean of Leyden, in a letter to Dr Monro in the year 1777, ſuppoſes it to be the medium by which ſulphur alſo is diſſolved. "Having been lately at Aix-La-Chapelle (ſays he), I mixed a ſolution of arſenic in the marine acid with ſome of the water of the emperor's bath, and immediately a true and genuine ſulphur was precipitated to the bottom of the veſſel in which the water was contained: which convinced me that the ſulphur was diſſolved by means of fixed air, though Sir Torbern Bergman thinks otherwiſe, and that the ſulphur is ſuſpended by means of phlogiſton, and the matter of heat united in the waters; and he ſays, that if the concentrated nitrous acid be added to theſe waters, it ſeizes the phlogiſton, precipitates the ſulphur, and takes away the hepatic ſmell." If ſulphur is by this medium ſuſpended in

water, however, it muſt be by a natural proceſs, with which we are entirely unacquainted; for we cannot unite ſulphur and fixed air artificially. We are not informed whether there is any native mineral water impregnated only with fixed air; probably, indeed, there is not, for water thus impregnated becomes a very active ſolvent of calcareous and other earths, and muſt undoubtedly meet with ſomething or other of this kind in paſſing through the ground. Many waters in Germany, particularly in the neighbourhood of the Rhine, are very much impregnated with this acid, and are eſteemed otherwiſe pretty pure; but they have never been examined chemically to diſcover whether they are not impregnated alſo with ſome proportion of metallic or earthy ſubſtances.

4. *Vegetable alkali* was long ſuppoſed to be a production entirely artificial; but ſome late authors ſeem to think that it is a native ſalt as well as the vegetable alkali. M. Margraaf mentions his having got a true nitre, the baſis of which is the vegetable alkali, from ſome waters at Berlin. M. Monnet ſays, that from the Pohoun ſpaw water he obtained eight grains of a grey-coloured alkaline ſalt from a reſiduum of twelve Paris pints of the water, which he ſaturated with the vitriolic acid; and on diluting, evaporating, and cryſtallizing, he obtained a tartarus vitriolatus, and not a Glauber's ſalt as he expected. Dr Hoffman affirms, that he obtained a vitriolated tartar from the Seltzer water by mere evaporation: but as this ſalt has neither been found in Seltzer nor any other water by other chemiſts, it is probable that he has been miſtaken.

5. The *foſſil alkali* is found in many waters in Hungary, Tripoli, Egypt, and other countries where that ſalt is found native. It is combined in Seltzer water, and other acidulous waters, with fixed air, and may be obtained from them pretty pure by ſimple evaporation. M. Monnet informs us, that he has obtained it in tolerable purity from the waters of Auvergne: but in moſt of the alkaline waters this ſalt was in an imperfect ſtate, and may be called rather an embryo than a perfect ſalt; for it would not cryſtallize, and made a very imperfect neutral ſalt with acids. It was incapable alſo of decompoſing the ſelenites, which was frequently found along with it in the ſame water.—Bergman makes mention of an imperfect alkaline ſalt; but obſerves, that all of that kind which he had an opportunity of examining, appeared to him to be no other than a genuine mineral alkali mixed with deliqueſcent ſalts.

In ſome of the mineral waters near volcanoes, this kind of alkali has been found ſo intimately united with phlogiſton as to be capable of producing a true Pruſſian blue, on adding a ſolution of ſilver or of green vitriol to the water; of which an example is given by Dr Nichola Andrea, in the thermal waters of a ſpring in the iſland of Iſchia.

6. *Volatile alkali* has formerly been accounted an ingredient in mineral waters; but Dr Hoffman, and moſt of the later chemiſts, have denied this, as the volatile alkali is not a mineral ſubſtance. It is poſſible, indeed, that ſome waters in the neighbourhood of great quantities of putrid matter may give ſome tokens of volatile alkali, as was the caſe with Rathbone-place water, analyſed by the Hon. Henry Cavendiſh.

7. *Glauber's ſalt.* Many mineral waters contain a portion of this ſalt, though the quantity is commonly very ſmall. However, M. Boulduc, in the memoirs of the academy of ſciences at Paris for 1724, makes mention of the waters of a ſpring in the neighbourhood of a village about three leagues from Madrid, which, by evaporation, yields a true Glauber's ſalt.—This ſalt, he ſays, is found in a concreted ſtate about the ſides of the ſpring, reſembling the icicles which in winter hang from the roofs of houſes. From this circumſtance, it would ſeem that the water of the ſpring was very richly impregnated with the ſalt; and Dr Nichola Andrea ſpeaks of a water at Sællia, in Calabria, which is ſo ſtrongly impregnated with this kind of ſalt, that he thinks it would be worth while to prepare it from thence in the way of trade. It is very probable that ſuch waters are frequently to be met with in countries where the ſoil is impregnated with mineral alkali.

8. *Common nitre.* In ſome of the barren provinces of Bengal, the earth is ſo ſtrongly impregnated with this ſalt, that the ſurface is covered with a nitrous cruſt reſembling hoar-froſt; and in ſuch places the waters are ſtrongly impregnated with it, as may naturally be ſuppoſed. In colder countries, however, this impregnation is more rare, though inſtances of perfect nitre being found in ſprings are not wanting in Europe; but no natural combination of nitrous acid with foſſil alkali, or cubic nitre, has yet been met with in any part of the world.

9. *Sea ſalt.* This abound not only in the waters of the ocean, but in great numbers of ſalt ſprings; and there are but few waters ſo pure as not to contain ſome portion of it.

10. *Aerated foſſile alkali.* This is found in Seltzer, and other waters of that kind, but combined with ſuch a quantity of fixed air, that the acrid taſte of the alkali is entirely covered, and the water has a briſk acidulous one. By evaporating the water, however, this ſuperfluous quantity of air is diſſipated, and the alkali then appears in its more acrid ſtate.

11. *Gypſum*, or *ſelenites.* This compoſition of the vitriolic acid and lime is extremely common in mineral waters. For a long time it was ſuppoſed to be a ſimple earth or ſtone, on account of its difficult ſolubility in water, requiring 700 or 800 times its own weight of water to diſſolve it artificially, though Dr Rutty informs us, that the water in which it is originally diſſolved will contain four or five times that proportion. There are to appearance ſeveral kinds of this ſubſtance; but whether they ariſe from foreign mixture, or from any difference in the calcareous earths among themſelves, we know not. It is not, however, conſidered as a medicinal ingredient, nor indeed is the internal uſe of it thought to be very ſafe.

12. *Epſom ſalt.* Bergman and ſome other chemiſts have reduced all the calcareous purging ſalts in which the vitriolic acid is concerned; but Dr Monro obſerves, that theſe ſalts not only cryſtallize in various modes, but have different degrees of ſolubility in water.—Thus the Epſom ſalt, properly ſo called, diſſolves in an equal quantity of water; while the calcareous nitres, or purging ſalts from mineral waters, require from 10 to 80 times their weight to diſſolve them.—This matter would require the analyſis of a great number

ber of ſalts, obtained from mineral waters in large quantity, and has not yet been thoroughly explained. Theſe ſalts, however, are ſeldom met with by themſelves in mineral waters, but uſually mixed with ſea-ſalt, iron, earth, ſulphureous matter, &c. Dr Rutty tells us, that a mineral water begins to be laxative when it contains ten grains of this ſalt to a pint, or 80 to a gallon.

13. *Alum.* This was formerly ſuppoſed to be a very common ingredient in mineral waters: but more accurate obſervations have ſhown it to be very rare, inſomuch that Dr Hoffman thinks it is not to be met with in any. Dr Layard, however, in the 56th volume of the Philoſophical Tranſactions, gives an account of a chalybeate water at Somerſham, from which he got five grains of alum out of two pounds of the water. Dr Rutty ſuppoſes that the mineral water at Ballycaſtle, in Ireland, contains alſo a portion of this ſalt.

14. *Calcareous nitre.* This is rarely found in mineral waters, though common enough in ſuch as are ſimply called *hard* waters. Dr Monro ſays, that the only one containing this ingredient which he ever heard of is one mentioned by Dr Home, in his treatiſe on bleaching.

15. 16. *Muriated calcareous earth, and muriated magneſia.* Muriated calcareous earth is likewiſe a rare ingredient in mineral waters, though frequently mentioned by writers on this ſubject. Bergman informs us, that he obtained a ſmall quantity from a ſpring in Oſtro-Gothland: and Dr Monro got ſome from the water of a ſalt ſpring at Pitkeathly, near Perth, in Scotland. It is found, as well as muriated magneſia, in ſea water, though the latter is much more abundant, and probably to be met with in all ſalt waters whatever, but is very difficult to be obtained in a cryſtalline form; though its preſence and nature may always be aſcertained, by dropping vitriolic acid into the concentrated liquor ſuppoſed to contain it, which will both precipitate the calcareous earth, and raiſe the marine acid in vapours. Muriated magneſia is likewiſe found in ſalt waters, and abounds in thoſe of the ocean. It is the principal ingredient in the bitter ley remaining after the ſalt is extracted from ſea-water, and is much more capable of being cryſtallized than the former.

17. *Aerated calcareous earth,* and *aerated magneſia.* Both theſe earths may be diſſolved by means of fixed air, and frequently are ſo in mineral waters, as well as iron. They are likewiſe often found in great quantity in hard waters; nor is there probably any kind of water, unleſs that which is diſtilled, entirely void of them.—When ſuch waters are boiled, the air evaporates, and the earth falls to the bottom, which will alſo be the caſe upon long expoſure to the air. Hence originates the cruſt upon tea-kettles, the petrefactions upon different ſubſtances immerſed in ſome kinds of water, &c. Hence alſo hard waters become ſoft, by running in channels for a conſiderable way: and to this cauſe we may with probability aſcribe the growth of ſtones in rivulets.

18. *Vitriolated copper.* This ſalt is ſeldom found, except in waters which flow from copper mines. The water impregnated with it is emetic and purgative, and may juſtly be accounted poiſonous rather than medicinal. On dipping clean iron into ſuch water, the copper is inſtantly precipitated in its metallic ſtate, and the iron diſſolved in its ſtead. Sometimes the quantity of copper is ſo great, that it is found advantageous to extract it in this way, as is the caſe in a certain ſtream in Ireland.

16. *Vitriolated iron* is found in conſiderable quantity in ſeveral waters both of England, Scotland and Ireland, as well as in many countries on the continent. Some authors have imagined, that there is a kind of volatile vitriol with which waters are ſometimes impregnated. An anonymous author, in a work intitled *delle Terme Portenze*, publiſhed at Rome in 1768, informs us, that having fixed a glaſs receiver to a hole through which the vapour of the water riſes from the aqueduct below, he found in it a month afterwards, as well as in the mouth of the hole, a concrete and incruſtated ſubſtance, like ſtalactite, which by experiment proved to be a true ſalt of iron, with a ſuperabundant quantity of acid. Hence he concludes that this water, as it riſes from the ſpring, is impregnated with a fine volatile martial vitriol, in ſuch ſmall proportion that it cannot be diſcovered in any quantity that may be analyſed in retorts or ſtills, though it may be diſcovered by confining for a long time the vapour, which is naturally and conſtantly ſublimed from the whole body of the thermal water diſcharged from the ſpring, as it paſſes through the aqueducts. The water of this ſpring is ſtrongly ſulphureous, and its heat 92 degrees of Fahrenheit.

Another kind of ſuppoſed volatile vitriol is that compoſed of iron, diſſolved by fixed air. The notion of this being a volatile ſubſtance aroſe from obſerving that there are ſome waters which taſte ſtrongly chalybeate at the fountain, but, after running for a little way, loſes it entirely. This, however, is founded on a miſtake: for it is only one of the ingredients, viz. the fixed air, which flies off when it is combined with earth: after which the iron precipitates in a ſimilar manner.

20. *Vitriolated zinc.* This has been found native in the bowels of the earth; and thence has been ſuppoſed, not without reaſon, to be an ingredient in mineral waters: but none have yet brought any deciſive experiments on this ſubject, except Dr Rutty and Dr Gmelin, who both ſay that they have obtained a white vitriol from mineral waters which were at the ſame time impregnated with iron and ſome other ingredients.

21. *Muriated magneſia.* Waters impregnated with this ſalt are mentioned both by Bergman and Scheele; but the particular properties of them are not known.

22. *Arſenic* has been ſuppoſed ſometimes to be an ingredient in mineral waters, though no certain proofs of its exiſtence have been brought. Poiſonous ſprings ſuppoſed to be impregnated with it, are mentioned by Varenius: and Dr Baldaſſari tells us of a ſmall ſpring (near to the Aqua Sancta, in the country of Siena), the waters of which kill any animal that drinks them. He ſuſpects this to be owing to arſenic, but was afraid to analyſe the water.

23. *Foſſil oils.* Almoſt all waters, even thoſe which are accounted the moſt pure, contain ſome portion of an oily matter though generally ſo ſmall that it cannot be perceived without evaporating a large quantity of the liquid. Some contain it in great quantity; inſomuch that, beſides impregnating the water as ſtrongly as poſſible, a great quantity falls to the bottom,

tom, or ſwims on the top. The other ingredients of theſe bituminous waters have not been examined; but in whatever manner the oil is united with the water, a portion of it adheres very obſtinately, ſo that it cannot be fully ſeparated even by filtration through paper. A fine bituminous vapour riſes from the bottom of ſome wells, and prevades the water, taking fire on the application of any flaming ſubſtance, though no oil is obſerved in the water itſelf. Of this kind are the burning wells at Broſely and Wigan in Lancaſhire in England, and others in different countries.—The cauſe of the inflammation of theſe waters was firſt diſcovered in 1759 by Mr Thomas Shirley, who cauſed the waters of the well at Wigan to be drained away; and found that the inflammable vapour roſe from the ground at the bottom, where it would take fire, as it did at the ſurface of the water. On applying his hand to the place whence the vapour iſſued, he found the impulſe of it like a ſtrong breath; or wind; and the ſame ſenſation was felt on applying his hand to the ſurface of the water. See *Phil. Tranſ.* vol. 26.

24. *Sulphur.* This is a common ingredient in mineral waters; and its preſence is known by the ſtrong hepatic ſmell they emit, as well as by their blackening ſilver. &c. Sulphureous waters are frequently very clear and tranſparent when taken up at the fountain; but when kept in open veſſels, or bottles not well ſtopped, they ſoon depoſit the ſulphur they contain in the form of a dirty white powder, and loſe their ſulphureous ſmell. The bottom of the wells containing ſuch waters, or of the channels in which they run, aſſume a black colour, and a raggy kind of matter is depoſited on ſuch ſubſtances as they run over for ſome time; and when theſe are taken up and dried, they appear covered with a true ſulphur. Some waters contain this ingredient in very conſiderable quantity. From that of Harrowgate it may be ſeparated by filtration; and Father de Tertre, in the ſecond volume of his *Hiſtoire Naturelle des Antilles*, tells us, that when he was in the iſland of Guadaloupe, and amuſing himſelf one day with evaporating in a tin plate ſome ſulphureous water which he found near the burning mountain, there remained on the plate a layer of ſulphur about the thickneſs of a leaf of paper. Dr Monro mentions his having obtained a true ſulphur, by evaporation, from a mineral water at Caſtle-Leod, in the county of Roſs, in Scotland. Dr Brown, in his Travels, informs us, that having cauſed ſome of the pipes which carry off the water from the duke's bath at Baden, in Auſtria, to be opened, he took from thence a quantity of fine ſulphur in powder, ſomething like flower of brimſtone, which had been ſublimed from the waters. A ſimilar kind of ſulphur is obtained from the upper part of the pipes and conduits which convey the waters of Aix-la-Chapelle from their ſources.

From theſe and other facts of a ſimilar nature, Dr Monro concludes, that ſulphur is diſſolved by ſome means or other in the water. Great differences however have taken place among chemiſts concerning the mode in which ſulphur is thus diſſolved. Sulphur, we know, may be diſſolved by means of an alkali, as well as by calcareous earth; and there are ſome inſtances of alkaline waters containing ſulphur, though we are not abſolutely certain that the alkaline ſalt is the bond of union betwixt the ſulphur and them. Dr Vandellius, in his treatiſe *de Thermis agri Patavini*, already quoted, mentions a ſubſtance found in the conduits of the waters of the baths at Aponum, which he calls cryſtallized ſulphur, and ſays that it diſſolves in the waters by boiling, recovering afterwards its ſolid form. This ſubſtance has not been examined; but we know of no other mineral with which ſulphur readily aſſumes a cryſtalline form than terra ponderoſa.—This compound is eaſily diſſolved in water, and communicates to it a moſt powerful taſte and ſmell of hepar ſulphuris. Great part of the terra ponderoſa, though not the whole, may be ſeparated by fixed air, ſo that it is probably this permanent compound which Vandellius obſerved. Dr Lucas ſuppoſed that the ſulphureous waters contain both an acid and phlogiſton; and Sir Torbern Bergman, that they are impregnated only with the hepatic gas: and that this gas conſiſts of ſulphur united with phlogiſton, from which the ſulphur may be precipitated by the nitrous acid.

For an account of the cauſe of heat in mineral waters, ſee the article Springs.

Having now mentioned the principal ſubſtances that form almoſt all theſe waters, we ſhall next ſhow the proofs by means of which they may be diſcovered in water, without decompoſing the water by evaporation or by diſtillation.

If any portion of diſengaged acid or alkali be contained in water, it may be known by the taſte, by changing the colour of violets or of turnſol, and by adding the preciſe quantity of acid or of alkali that is neceſſary for the ſeparation of the contained diſengaged ſaline matter.

Sulphur, and liver of ſulphur, may be diſcovered in waters by their ſingular ſmell, and by the black colour which theſe ſubſtances give to white metals or to their precipitates, but eſpecially to ſilver.

Vitriolic ſalts with earthy baſis may be diſcovered in water by two proofs; 1. By adding ſome fixed alkali, which decompoſes all theſe ſalts, and precipitates their earthy baſis; and, 2. By adding a ſolution of mercury in nitrous acid, which alſo decompoſes theſe ſalts, and forms a *turbith mineral* with their acid. But for this purpoſe the ſolution of mercury ought to have a ſuperabundant quantity of acid; for this ſolution when perfectly ſaturated, forms a precipitate with any kind of water, as M. Rouelle has very juſtly remarked: and indeed, all metallic ſolutions in any acids are ſtrictly capable of decompoſition by water alone, and ſo much more eaſily as the acid is more perfectly ſaturated with the metal.

Martial vitriol or iron combined with any acid, or even with gas, ſhows itſelf in waters by blackening an infuſion of galls, or by forming a Pruſſian blue with the phlogiſticated alkaline lixivium.

The vitriol of copper, or copper diſſolved by any acid, may be diſcovered by adding ſome of the volatile ſpirit of ſal ammoniac, which produces a fine blue colour; or by the addition of clean iron, upon the ſurface of which the copper is precipitated in its natural or metalic ſtate.

Glauber's ſalt is diſcovered by adding a ſolution of mercury in nitrous acid, and forming with it a turbith mineral: or by cryſtallization.

Common ſalt contained in waters forms with a ſolution

lution of ſilver in nitrous acid a white precipitate, or luna cornea. It may alſo be known by its cryſtallization. Marine ſalt with earthy baſis produces the ſame effect upon ſolution of ſilver. It alſo forms a precipitate when fixed alkali is added. The acrimony, bitterneſs, and deliqueſcency of this ſalt, ſerve to diſtinguiſh it.

The proofs related for the examination of mineral waters, are only thoſe which are moſt eſſential. Many others may be made to confirm the former proofs: but the details of theſe are too extenſive to be inſerted here. We ſhall add only two of them, becauſe they are very general, and may be very uſeful.

The firſt is the production of artificial ſulphur, or of the volatile ſulphureous acid; by which means the vitriolic acid may be diſcovered in any combination whatever. For this purpoſe, the matter to be examined muſt be mixed with any inflammable ſubſtance, and expoſed to a red heat. If this matter contained but a particle of volatile acid, it would be rendered ſenſible by the ſulphur, or by the vitriolic ſulphureous acid thence produced.

The ſecond general proof for mineral waters which we ſhall mention here, ſerves to diſcover any metallic ſubſtance whatever, diſſolved in water by any acid. This proof conſiſts in adding ſome of the liquor ſaturated by the colouring matter of Pruſſian blue. This liquor produces no effects upon any neutral ſalts with earthy or alkaline baſes, but decompoſes all metallic ſalts: ſo that if no precipitate be formed upon adding ſome of this liquor, we may be certain that the water does not contain any metallic ſalt; and on the contrary, if a precipitate be formed, we may certainly infer that the water does contain ſome metallic ſalt.

Two kinds only of gas, or the ſpirituous volatile part of ſome waters, are hitherto known; of which one is the volatile ſulphureous acid, and the other is fixed air. See AEROLOGY, FIXED *Air*, and GAS, *paſſim*. Air united ſuperabundantly with ſpirituous waters is the chief cauſe of their lightneſs, piquancy, and ſparkling.

When the nature and quantities of the principles contained in a mineral water are aſcertained by ſuitable experiments, we may imitate artificially this water, by adding to pure water the ſame proportions of the ſame ſubſtances, as Mr Venel has done in examining ſeveral waters, eſpecially that of Selters.

We may eaſily perceive the neceſſity of uſing no veſſels in theſe experiments, but ſuch as are perfectly clean and rinſed with diſtilled water; of weighing the products of the experiments very exactly; of making the experiments upon as large quantities of water as is poſſible, eſpecially the evaporations, cryſtallizations, and diſtillations; and of repeating all experiments ſeveral times. We may further obſerve, that the mixtures from which any precipitates might be expected ought to be kept two or three days, becauſe many of theſe precipitates require that time, or more, to appear, or to be entirely depoſited.

An ALPHABETICAL TABLE of the moſt noted Mineral Waters in Europe, exhibiting their Medicinal Properties and Contents.

Names of Springs.	*Countries in which they are found.*	*Contents and quality of the water.*	*Medicinal Virtues.*
Abcourt,	Near St Germain's in France.	A cold chalybeate water, containing beſides the iron a ſmall quantity of foſſil alkali ſaturated with fixed air.	Diuretic and purgative. Internally uſed in dropſies, jaundice, and obſtructions of the viſcera; externally in ſcorbutic eruptions, ulcers, &c.
Aberbrothick,	County of Forfar in Scotland.	A cold chalybeate. Contains iron diſſolved in fixed air.	Diuretic and corroborative. Uſed in indigeſtions, nervous diſorders, &c.
Acton,	Middleſex county, England.	Contains Epſom and ſea ſalt. Cold.	Srongly purgative, and cauſes a ſoreneſs in the fundament.
Aghaloo,	Tyrone, Ireland.	Sulphur, foſſile alkali, and ſome purging ſalt. Cold.	Alterative and corroborant. Uſeful in ſcrofulous diſorders, worms and cutaneous diſeaſes.
Aix-la-Chapelle,	Juliers in Germany.	Sulphureous and hot. Contain aerated calcareous earth, ſea-ſalt, foſſile alkali and ſulphur.	Diaphoretic, purgative, and diuretic. Uſed as baths as well as taken internally. Uſeful in rheumatiſms, and all diſeaſes proceeding from a debility of the ſyſtem.
Alford or Awford,	Somerſetſhire, England.	A purging ſalt along with ſea-ſalt. Cold.	Strongly purgative.
Aſkeron,	Yorkſhire, in England.	Contains Epſom ſalt, aerated calcareous earth, and ſulphur. Cold.	Diuretic. Uſeful when drank in leproſy, ſcabs, and other cutaneous diſeaſes.
Antrim,	Ireland.		Similar to Barrowdale water, but weaker.
Baden,	Swabia in Germany.	Hot and ſulphureous ſprings and baths, reſembling thoſe of Aix-la-Chapelle.	See AIX-LA-CHAPELLE and BADEN, in the order of the alphabet.

Names of Springs.	*Countries in which they are found.*	*Contents and Quality of the Water.*	*Medicinal Virtues.*
Bagnigge.	Middleſex, near London.	Epſom ſalt and muriated magneſia. Cold. Another ſpring contains iron and fixed air.	Strongly purgative, three half pints being a doſe. The chalybeate ſpring alſo proves purgative when the bowels contain any vitiated matter.
Balemore,	Worceſterſhire in England.	A fine cold chalybeate, containing iron rendered ſoluble by fixed air, along with ſome other ſalt ſuppoſed to be foſſile alkali.	Corroborative, and good in obſtructions of the viſcera. Drank from two to three pints in a morning.
Ball, or Baudwell,	Lincolnſhire in England.	A cold petrifying water; contains aerated calcareous earth or magneſia.	Corroborative and aſtringent. Drunk to the quantity of two pints, or two and an half.
Balaruc,	Languedoc in France.	Hot, and contain ſome purging ſalts.	Drank as purgatives, and uſed as hot-baths. Uſeful in ſcrofulous and cutaneous diſorders.
Ballycaſtle,	Antrim in Ireland.	Chalybeate and ſulphureous. Cold.	Reſembles that of Balemore in virtue.
Ballynahinch,	Down in Ireland.	Iron, fixed air, and ſulphur. Cold.	Uſeful in ſcorbutic diſorders and diſeaſes of indigeſtion.
Ballyſpellan,	Near Kilkenny in Ireland.	Iron, fixed air, and probably foſſile alkali.	Similar in virtue to that of Balemore.
Bagniers,	Biggore in France.	Earth and ſulphur. Hot.	The waters uſed in baths, like thoſe of Aix-la-Chapelle. Some of the ſprings purgative, others diuretic.
Bareges,	Biggore in France.	Sea-ſalt, foſſile alkali, calcareous earth, ſelenites, ſulphur, and a fine bituminous oil. Hot.	Diuretic and diaphoretic. Uſeful in nervous as well as cutaneous diſorders, in old wounds, and ſome venereal complaints. Uſed as baths, as well as taken internally to the quantity of a quart or three pints.
Barnet, and North-hall,	Hertfordſhire in England.	Epſom ſalt, and aerated calcareous earth.	Purgative.
Barrowdale,	Cumberland in England.	A great quantity of ſea-ſalt, aerated calcareous earth, and ſome bittern. Cold.	Strongly emetic and cathartic. Sometimes uſeful in the jaundice and dropſy, ſcorbutic diſorders, chronic obſtructions. Uſed likewiſe as a bath in cutaneous diſeaſes. Taken in the doſe of a pint, containing only about ſeven drams and an half of ſea-ſalt; ſo that a great part of the virtue muſt reſide in the aerated calcareous earth.
Bath,	Somerſetſhire in England.	Iron, aerated calcareous earth, ſelenite, Glauber's ſalt, and ſea-ſalt. Hot.	Powerfully corroborative, and very uſeful in all kinds of weakneſſes. Uſed as a bath, and taken internally.
Bandola,	Italy.	Iron, fixed air, foſſile alkali, and a little ſulphur.—Cold.	Gently laxative, diuretic, and diaphoretic.
Brentwood,	Eſſex in England.	Epſom ſalt, and aerated calcareous earth.	Purgative.
Briſtol,	Somerſetſhire in England.	Calcareous earth, ſea-ſalt, Epſom-ſalt Glauber's ſalt, and ſelenites. Hot.	Uſed as a bath; and drank from four to eight ounces at a time, to two quarts per day. Uſeful in conſumptions, diabetes, fluor albus, &c.
Bromley,	Kent in England.	Iron and fixed air. Cold.	Diuretic and corroborative.
Broughton,	Yorkſhire in England.	Sulphur, ſea-ſalt, Epſom-ſalt, and aerated earth. Cold.	Similar to Harrowgate.
Buxton,	Derbyſhire in England.	A ſmall quantity of ſea-ſalt, foſſile alkali, Epſom-ſalt, and aerated calcareous earth. Hot. Here is alſo a fine cold chalybeate ſpring.	Uſeful in gout, rheumatiſm, and other diſorders in which tepid baths are ſerviceable. Uſed as baths, and drank to the quantity of five or ſix pints per day.

Names of Springs.	*Countries in which they are found.*	*Contents and Quality of the Water.*	*Medicinal Virtues.*
Carolinebaths,	Bohemia.	Iron, fixed air, aerated earth, ſea-ſalt, foſſile-alkali, Epſom ſalt, and Glauber's ſalt. Hot.	Purgative, and uſed as baths. Of ſervice in diſorders of the ſtomach and bowels, ſcrofula, &c.
Carlton,	Nottinghamſhire in England.	Iron diſſolved in fixed air, along with a bituminous oil, which gives it the ſmell of horſe-dung.—Cold.	Diuretic and corroborative.
Carrickfergus,	Antrim in Ireland.	Seems from its bluiſh colour to contain a very ſmall quantity of copper. Cold.	Weakly purgative.
Carrickmore,	Cavan in Ireland.	Foſſile alkali, fixed air, and ſome purging ſalt. Cold.	Purgative and diuretic.
Caſhmore,	Waterford in Ireland.	Green vitriol.	Purgative, diuretic, and ſometimes emetic.
Caſtle-Connel,	Limerick in Ireland.	Iron diſſolved in fixed air, &c. Cold.	Reſembles the German Spaw, and is in conſiderable repute.
Caſtle-Leod,	Roſs-ſhire in Scotland.	Aerated earth, ſelenites, Glauber's ſalt, and ſulphur. Cold.	Diuretic, diaphoretic, and corroborant; uſeful in cutaneous diſeaſes.
Caſtlemain,	Kerry in Ireland.	Iron, ſulphur, and fixed air. Cold.	Corroborant and diuretic.
Cawley,	Derbyſhire in England.	Epſom ſalt, aerated calcareous earth, and ſulphur. Cold.	Gently purgative.
Cawthorp,	Lincolnſhire in England.	Iron, fixed air, and probably foſſile alkali. Cold.	Purgative, and corrects acidities.
Chadlington,	Oxfordſhire in England.	Foſſile alkali, ſea-ſalt, and ſulphur. Cold.	Purgative.
Chaude Fontaine,	Liege in Germany.	Aerated earth, foſſile alkali, and fixed air. Hot.	Reſembles thoſe of Aix la Chapelle and Buxton.
Cheltenham,	Glouceſterſhire in England.	Calcareous earth, iron, Epſom ſalt, and common ſalt. Cold.	Purgative and corroborant; taken in the quantity of from one to three or four pints. Is uſeful in caſes of indigeſtion and ſcorbutic diſorders; alſo in the gravel.
Chippenham,	Wiltſhire in England.	Iron diſſolved in fixed air.	Diuretic and corroborative.
Cleves,	Germany.	Iron, fixed air, and other ingredients of Pyrmont water.	Diuretic and corroborant.
Clifton,	Oxfordſhire in England.	Foſſile alkali, and aerated calcareous earth or ſelenite. Cold.	Gently laxative, and uſed as a bath for cutaneous diſorders.
Cobham,	Surry in England.	Iron, and ſome purging ſalt.	Purgative, diuretic, and corroborant.
Codſalwood,	Staffordſhire in Enland.	Sulphur, fixed air, and aerated earth.	Reſembles the Aſkeron water.
Colcheſter,	Eſſex in England.	Epſom ſalt, and aerated calcareous earth.	Strongly purgative.
Colurian,	Cornwall in England.	Iron, fixed air, and aerated earth.	Corroborative and diuretic.
Comner, or Cumner,	Berkſhire in England.	Some purging ſalt, and probably aerated earth; the water is of a whitiſh colour.	Purgative, in the quantity of one, two, or three quarts.
Coolauran,	Fermanagh in Ireland.	Iron, fixed air, and aerated earth.	Diuretic.
Corſtorphin,	Mid-Lothian in Scotland.	Sulphur, ſea-ſalt, clay, and Epſom ſalt. Cold.	Diuretic and laxative.
Coventry,	Warwickſhire in England.	Iron, fixed air, and ſome purging ſalt.	Purgative, diuretic, and corroborant.

Names of Springs.	*Countries in which they are found.*	*Contents and Quality of the Water.*	*Medicinal Virtues.*
Crickle-Spaw.	Lancaſhire in England.	Sulphur, ſea-ſalt, and aerated earth.	Purgative, and reſembling Harrowgate water.
Croft,	Yorkſhire in England.	Aerated earth, vitriolated magneſia, and ſea-ſalt.	Purgative, and reſembling Aſkeron water.
Croſs-town,	Waterford in Ireland.	Martial vitriol.	Diuretic, purgative, and ſometimes emetic.
Cunley-houſe,	Lancaſhire in England.	Sulphur, aerated earth, and fixed air.	Purgative, and reſembling the Aſkeron water.
Das-WildBad,	Nuremberg in Germany.	Iron, fixed air, and ſome ſaline matter.	Corroborant. Uſeful in obſtructions of the viſcera, and female complaints.
D'Ax en Foix,	15 leagues from Thouloufe in France.	Similar to Aix-la-Chapelle. Hot.	Uſed as a bath, and alſo drank, like the Aix-la-Chapelle waters.
Deddington,	Oxford in England.	Iron, ſulphur, aerated earth, ſea-ſalt, or foſſile alkali.	Alterative, purgative in large quantity, and uſeful in ſcorbutic and cutaneous diſorders.
Derby,	Near the capital of Derbyſhire in England.	Iron diſſolved by fixed air.	Corroborant.
Derryinch,	Fermanagh in Ireland.	Sulphur and foſſile alkali.	Diuretic and diaphoretic.
Derrindaff,	Cavan in Ireland.	Sulphur and purging ſalt.	Similar to the *Aſkeron* water.
Derryleſter,	Cavan in Ireland.	Similar to *Swadlingbar* water.	
Dog and Duck,	St George's-fields, London.	Aerated magneſia, Epſom ſalt, and ſea-ſalt.	Cooling and purgative, but apt to bring on or increaſe the fluor albus in women.
Dortſhill,	Staffordſhire in England.	Iron diſſolved in fixed air.	Corroborant.
Drig-well,	Cumberland in England.	Similar to Deddington.	
Dropping-well,	Yorkſhire in England.	Aerated earth.	Aſtringent and corroborant.
Drumas-nave,	Leitrim in Ireland.	Sulphur, foſſile alkali, with ſome purging ſalt.	Powerfully diuretic and anthelmintic, and of uſe in cutaneous and ſcrofulous diſorders.
Drumgoon,	Fermanagh in Ireland.	Similar to the former.	
Dublin ſalt ſprings,	Ireland.	Sea-ſalt and Epſom ſalt.	Purgative.
Dulwich,	Kent in England.	Sea-ſalt and Epſom ſalt.	Purgative and diuretic. Uſeful in nervous caſes and diſeaſes proceeding from debility.
Dunnard,	18 miles from Dublin.	Iron diſſolved in fixed air.	Diuretic and corroborant.
Dunſe,	Scotland.	Iron diſſolved in fixed air, with a little ſea-ſalt and bittern.	Similar to the former.
Durham,	England.	Sulphur, ſea-ſalt, and a little aerated earth. In the middle of the river is a ſalt ſpring.	Similar to the Harrowgate water.—That of the ſalt ſpring uſed as a purgative.
Egra,	Bohemia.	Similar to Cheltenham water.	
Epſom,	Surry in England.	Vitriolated and muriated magneſia, with a ſmall quantity of aerated calcareous earth.	Purgative, and of uſe in waſhing old ſores.
Fairburn,	Roſs-ſhire in Scotland.	Sulphur, aerated earth, and Glauber's ſalt.	Alterative, and uſeful in cutaneous diſeaſes.
Felſtead,	Eſſex in England.	Similar to Iſlington.	
Filah,	Yorkſhire in England.	Sea-ſalt and aerated earth.	Powerfully diuretic and purgative.
Frankfort,	Germany.	Sulphur and ſea-ſalt.	Similar to Harrowgate.

Names of Springs.	*Countries in which they are found.*	*Contents and Quality of the Water.*	*Medicinal Virtues.*
Gainſborough	Lincolnſhire in England.	Sulphur, iron, aerated earth, and Epſom ſalt.	Diuretic and laxative.
Galway,	Ireland.	Similar to Tunbridge water.	
Glanmile,	Ireland.	Similar to Peterhead water.	
Glaſtonbury,	Somerſetſhire in England.	Similar to Clifton water.	
Glendy,	Merns county in Scotland.	Similar to Peterhead water.	
Granſhaw,	Down in Ireland.	Iron; ſimilar to the German Spaw.	
Haigh,	Lancaſhire in England.	Green vitriol, iron diſſolved by fixed air, with ſome aerated earth.	Emetic and cathartic.
Hampſtead,	England.	Green vitriol, iron diſſolved by fixed air, and a ſmall quantity of aerated earth.	Alterative and corroborant. The water is taken from half a pint to ſeveral pints; is better in the morning than in the middle of the day, and in cold than hot weather.
Hanbridge,	Lancaſhire in England.	Similar to Scarborough water.	Leſs purgative than the Scarborough water.
Hanlys,	Shropſhire in England.	Epſom, or other purging ſalt.	Purgative.
Harrowgate,	Yorkſhire in England.	Sulphur, ſea-ſalt, and ſome purging ſalt. Some chalybeate ſprings here alſo.	Alterative, purgative, and anthelmintic; uſeful in ſcurvy, ſcrofula, and cutaneous diſeaſes. Uſed externally for ſtrains and paralytic weakneſſes.
Hartfell,	Annandale in Scotland.	Green vitriol.	Aſtringent and corroborant. Uſeful in all kinds of inward diſcharges of blood.
Hartlepool,	Durham in England.	Sulphur, iron diſſolved by fixed air, with ſome purging ſalt.	Diuretic and laxative.
Holt,	Wiltſhire in England.	Purging ſalt, with a large quantity of aerated earth.	Mildly purgative. Uſeful in old ulcers and cutaneous diſorders.
Joſeph's well,	Stock Common near Cobham in Surry.	A very large proportion of Epſom ſalt, and poſſibly a little ſea-ſalt.	Alterative, purgative, and diuretic. Drank to about a quart, it paſſes briſkly without griping: taken in leſs doſes as an alterative, it is a good antiſcorbutic.
Ilmington,	Warwickſhire in England.	Aerated foſſile alkali, with ſome iron diſſolved by fixed air.	Diuretic and laxative.
Inglewhite,	Lancaſhire in England.	Sulphur, and iron diſſolved by fixed air.	Alterative. Uſeful in ſcorbutic and cutaneous diſeaſes.
Iſlington,	Near London.	Iron diſſolved by fixed air.	Corroborant. Uſeful in lowneſs of ſpirits and nervous diſeaſes. Operates by urine, and may be drank in large quantity.
Kanturk,	Cork in Ireland.	Similar to the water at Peterhead.	
Kedleſtone,	Derbyſhire in England.	Sulphur, ſea-ſalt, and aerated earth.	Similar to Harrowgate; but intolerably fetid.
Kenſington,	Near London.	Similar to Acton water.	
Kilbrew,	Meath in Ireland.	A large quantity of green vitriol.	Emetic and cathartic, in the doſe of half a pint.
Killburn,	Near London.	Fixed air, hepatic air, Epſom ſalt, Glauber's ſalt: muriated magneſia, ſea-ſalt, aerated earth, and iron.	
Killaſher,	Fermanagh in Ireland.	Sulphur and foſſile alkali.	Similar to Swadlingbar water.
Killingſhanvally,	Fermanagh, Ireland	Smilar to Hanly's chalybeate water.	

Kilroet

Names of Springs.	*Countries in which they are found.*	*Contents and Quality of the Water.*	*Medicinal Virtues.*
Kilroot,	Antrim in Ireland.	Nature of Barrowdale water, but weaker.	
Kinalton,	Nottinghamſhire in England.	A purging ſalt.	Purgative.
Kincardine,	Merns in Scotland.	Similar to the water of Peterhead.	
Kingſcliff,	Northamptonſhire in England.	Similar to Cheltenham waters.	
Kirby,	Weſtmoreland in England.	Iron, fixed air, and probably ſome foſſile alkali.	Laxative, and uſeful in correcting acidities.
Knareſborough,	See *Dropping-well.*		
Knowſley,	Lancaſhire in England.	Similar to Scarborough water.	
Kuka,	Bohemia.	Aerated fixed alkali.	Operates by inſenſible perſpiration ſometimes by ſpitting, ſweat, or urine.
Lancaſter,	England,	Similar to Tunbridge water.	
Latham,	Lancaſhire in England.	Similar to the former.	
Llandrindod,	Radnor in South Wales.	Three ſprings; a purgative, a ſulphureous, and chalybeate.	Uſeful in the ſcurvy, leproſy, cutaneous diſorders, &c.
Llangybi,	Caernarvonſhire in North Wales.		Uſeful in diſorders of the eyes, ſcrofula, &c.
Leamington,	Warwickſhire in England.	Sea-ſalt and aerated calcareous earth.	Emetic and cathartic. Uſeful in old ſores, and cures mangy dogs.
Leez,	Eſſex in England.	Similar to Iſlington water.	
Lincomb,	Somerſetſhire in England.	Aerated iron, foſſile alkali, and a Little Epſom ſalt.	
Liſbeak,	Fermanagh in Ireland.	Sulphur, &c.	Similar to Swadlingbar water.
Lis-done-Vurna,	Clare in Ireland.	Foſſile alkali, with much iron.	Emetic, cathartic, and diuretic.
Loanſbury,	Yorkſhire in England.	Sulphur, and ſome purging ſalt.	Uſed only for waſhing mangy dogs and ſcabby horſes.
Maccroomp,	Cork in Ireland.	Similar to Ilmington water.	
Mahereberg,	Kerry in Ireland.	Similar to Barrowdale water.	
Mallow,	Cork in Ireland.	A hot water, ſimilar to that of Briſtol.	
Malton,	Yorkſhire in England.	Iron and fixed air in conſiderable quantity.	Similar to Scarborough water, but is ſometimes apt to vomit.
Malvern,	Glouceſterſhire in England.	Iron. Two ſprings.	Diuretic and cathartic; uſed alſo externally. Recommended as excellent in diſeaſes of the ſkin; in leproſies, ſcorbutic complaints, ſcrofula, old ſores, &c. Alſo ſerviceable in inflammations and other diſeaſes of the eyes; in the gout and ſtone, in bilious and paralytic caſes, and in female obſtructions. The external uſe is by waſhing the part at the ſpout ſeveral times a-day, and afterwards covering it with cloths dipt in the water and kept conſtantly moiſt; alſo by general bathing.
Markſhall,	Eſſex in England.	Similar to Iſlington.	
Matlock,	Derbyſhire in England.	Warm ſprings, of the nature of the Briſtol water, except that they are very ſlightly impregnated with iron, but contain a great quantity of aerated earth. They are colder than the Buxton; but their virtues ſimilar to thoſe of the two places mentioned.	

Names of Springs.	*Countries in which they are found.*	*Contents and Quality of the Water.*	*Medicinal Virtues.*
Maudiley,	Lancaſhire in England.	Sulphur and ſea-ſalt.	Similar to Harrowgate.
Mechan	Fermanagh in Ireland.	Sulphur and foſſile alkali.	Similar to the waters of Drumgoon.
Miller's Spaw,	Lancaſhire in England.	Similar to Tunbridge.	
Moffat,	Annandale in Scotland.	Sulphur, ſea-ſalt, and earth.	Alterant, diuretic, and ſometimes purgative. Is uſed as a bath, and the ſteam of the hot water has been found ſerviceable in relaxing hard tumors and ſtiff joints.
Moſs-houſe.	Lancaſhire in England.	Similar to Iſlington water.	Purges ſtrongly.
Moreton,	Shropſhire in England.	Similar to Holt water.	
Mount D'Or,	France.	Warm, and ſimilar to the waters of Aix-la-Chapelle.	Diuretic, purgative, and diaphoretic.
Nevil-Holt,	Leiceſterſhire in England.	Selenite or aerated earth, and Epſom ſalt.	Purgative, diuretic, and diaphoretic.—Powerfully antiſeptic in putrid diſeaſes, and excellent in diarrhœa, dyſenteries, &c.
New Cartmall,	Lancaſhire in England.	Sea-ſalt and aerated earth.	Purgative.
Newham Regis,	Warwickſhire in England.	Similar to Scarborough water.	
Newtondale,	Yorkſhire in England.	Aerated calcareous earth or magneſia.	Aſtringent or tonic.
Newton-Stewart,	Tyrone in Ireland.	Similar to Tunbridge.	
Nezdenice,	Germany.	Fixed air, foſſile alkali, iron, and earth.	Diuretic, diaphoretic, and tonic.
Nobber,	Meath in Ireland.	Martial vitriol.	Similar to Hartfell.
Normanby,	Yorkſhire in England.	Sulphur, much fixed air, ſome ſea-ſalt, and Epſom ſalt.	Similar to Aſkeron water.
Nottington,	Dorſetſhire, England.	Sulphur, foſſile alkali, and earth.	Uſeful in cutaneous diſeaſes.
Orſton,	Nottingham, England.	Much fixed air, Epſom ſalt, and a little ſea-ſalt, with ſome iron.	Purgative.—It intoxicates by reaſon of the great quantity of air contained in it.
Oulton,	Norfolk, England.	Similar to Iſlington.	
Owen Breun,	Cavan, Ireland.	Sulphur, Epſom ſalt, and foſſile alkali.	Similar to Aſkeron water.
Pancras,	Near London.	Epſom ſalt, and aerated earth.	Diuretic and purgative.
Paſſy,	Near Paris.	Similar to Pyrmont water.	
Peterhead,	Aberdeen county, Scotland.	A ſtrong chalybeate but of which no analyſis has been publiſhed.	Similar to Iſlington, but more powerful.
Pettigoe,	Donnegal, Ireland.	Sulphur and purging ſalt.	Similar to Aſkeron water.
Pitkeathly,	Perthſhire, Scotland.	Sea-ſalt, a ſmall quantity of muriated and likewiſe of aerated earth.	Gently purgative. Very uſeful in ſcrofulous and ſcorbutic habits.
Plombiers,	Lorraine, France.	Saline matter, probably foſſile alkali, with a ſmall portion of oil.— Warm.	Uſed as a bath, and for waſhing ulcers. Inwardly taken it cures complaints from acidity, hemorrhagies, &c.
Pontgibault,	Auvergne, France.	Foſſile alkali and calcareous earth.	Diuretic and laxative.
Pougues,	Nivernois, France.	Calcareous earth, magneſia, foſſile alkali, ſea-ſalt, earth, of alum, and ſiliceous earth.	Diuretic and laxative.

Names of Springs.	*Countries in which they are found.*	*Contents and Quality of the Water.*	*Medicinal Virtues.*
Pyrmont,	Weſtphalia, Germany.	Aerated iron, calcareous earth, magneſia, Epſom, ſalt, and common ſalt.	Diuretic, diaphoretic, and laxative. Recommended in caſes where the conſtitution is relaxed; in female complaints, in cutaneous diſeaſes, in nervous diſorders, in the gravel and urinary obſtructions; and conſidered as among the beſt reſtoratives in decayed and broken conſtitutions.
Queen Camel,	Somerſetſhire, England.	Sulphur, ſea-ſalt, foſſile alkali, calcareous earth, and bituminous oil.	Uſed in ſcrofulous and cutaneous diſorders.
Richmond,	Surry in England,	Similar to Acton water.	
Rippon,	Yorkſhire, England,	Sulphur, ſea-ſalt, and aerated earth.	Diaphoretic and alterant.
Road,	Wiltſhire, England.	Sulphur, iron, foſſile alkali, and fixed air.	Uſeful in ſcrofula, ſcurvy, and cutaneous diſorders.—Acts as a laxative.
St Bartholomew's well,	Cork in Ireland.	Foſſile alkali, iron, and fixed air.	Similar to Tilbury water.
St Bernard's well,	Near Edinburgh.	Sulphureous volatile acid and phlogiſton.	Somewhat congenial with Moffat and Harrowgate. In nervous and ſtomachic caſes, analeptic and reſtorative; in ſcorbutic, ſcrofulous, and moſt dropſical caſes, reckoned a ſpecific.
St Eraſmus's well,	Staffordſhire, England.		Similar to Barrowdale water.
Scarborough,	Yorkſhire, England.	Aerated calcareous earth, Epſom ſalt, ſea-ſalt, and iron.	Diuretic and purgative.
Scollienſis,	Switzerland.	Iron, foſſile alkali, and a great quantity of fixed air.	Excellent in cholic pains, both as a cure and preventative.
Sedlitz,	Bohemia.	Epſom ſalt.	Strongly purgative.
Seltzer,	Germany.	Calcareous earth, magneſia, foſſile alkali, and fixed air.	Diuretic. Uſeful in the gravel, rheumatiſm, ſcurvy, ſcrophula, &c.
Sene, or Send,	Wiltſhire, England.	Similar to Iſlington.	
Seydſchutz,	Germany.	Similar to Sedlitz.	
Shadwell,	Near London.	Green vitriol.	Emetic and cathartic.
Shapmoor,	Weſtmoreland, England.	Sulphur and purging ſalt.	Similar to Aſkeron water.
Shettlewood,	Derbyſhire, England.		Similar to Harrowgate water.
Shipton,	Yorkſhire, England.	Sulphur, ſea-ſalt, and purging ſalt.	Similar to Harrowgate.
Somerſham,	Huntingdonſhire, England.	Green vitriol, alum and fixed air.	Corroborant and alterative. Uſeful for waſhing foul ulcers and cancers.
Spaw,	Liege in Germany.	Foſſile alkali, iron, aerated earth, Epſom ſalt, and ſea-ſalt.	Diuretic and purgative. Serviceable in many diſorders. See the article Spaw.
Stanger,	Cumberland, England.	Green vitriol.	Emetic and cathartic.
Stenfield,	Lincolnſhire, England.	Similar to Orſton.	
Streatham,	Surry, England.	Aerated earth, Epſom ſalt, ſea-ſalt, and muriated magneſia.	Purgative.
Suchaloza,	Hungary.		Similar to Nezdenice.
Sutton-bog,	Oxfordſhire, England.	Sulpur, foſſile alkali, and ſea-ſalt.	Alterative and laxative.
Swadlingbar,	Cavan in Ireland.	Sulphur, earth, ſea-ſalt, and foſſile alkali.	Alterative and diaphoretic.
Swanſey,	Glamorganſhire in North Wales.	Green vitriol.	Similar to Shadwell.
Sydenham,	Kent in England.	Similar to Epſom, but weaker	

Names of Springs.	*Countries in which they are found.*	*Contents and Quality of the Water.*	*Medicinal Virtues.*
Tarleton,	Lancaſhire in England.	Similar to Scarborough water.	
Tewkſbury,	Glouceſterſhire in England.	Similar to Acton.	
Thetford,	Norfolk in England.	Foſſile alkali, fixed air, and iron.	Purgative and diuretic.
Thornton,	Nottinghamſhire in England.	Similar to Orſton.	
Thurſk,	Yorkſhire in England.	Similar to Scarborough.	
Tibſhelf,	Derbyſhire in England.	Iron diſſolved in fixed air.	Similar to Spaw water.
Tilbury,	Eſſex in England.	Foſſile alkali.	Diuretic and diaphoretic.
Tober Bony,	Near Dublin in Ireland.	Foſſile alkali, earth, and bituminous oil.	Similar to Tilbury.
Tonſtein,	Cologne in Germany	Foſſile alkali.	Similar to Seltzer, but more purgative
Tralee,	Kerry in Ireland.	Similar to Caſtle Connel.	
Tunbridge,	Kent in England.	Iron, ſome ſea-ſalt, with a little ſelenites and calcareous earth.	An excellent chalybeate, uſeful in all diſeaſes for which the Spaw is recommended.
Upminſter,	Eſſex in England	Sulphur, foſſile alkali, and purging ſalt.	Purgative and diuretic.
Vahls,	Dauphiny in France.	Foſſile alkali.	Diuretic and laxative.
Wardrew,	Northumberland.	Sulphur, earth, and ſea-ſalt.	Similar to Harrowgate water.
Weatherſtack,	Weſtmoreland in England.	Iron, ſea-ſalt, and a ſmall quantity of hepatic gas.	Purgative.
Wallenfrow,	Northamptonſhire in England.	Similar to Iſlington water.	
Weſt Aſhton,	Wiltſhire in England.	Similar to Iſlington.	
Weſtwood,	Derbyſhire in England.	Green vitriol.	Similar to Shadwell. Uſed for waſhing ulcers of the legs.
Wexford,	Ireland.	Similar to Iſlington.	
Whiteacre,	Lancaſhire in England.	Aerated iron and probably calcareous earth.	Somewhat aſtringent
Wiggleſworth	Yorkſhire in England.	Sulphur, earth, and common ſalt.	Emetic in the quantity of two quarts, and ſaid to be cathartic in the quantity of three; a ſingular circumſtance if true.
Wildungan,	Waldech in Germany.	Similar to the waters of Bath.	Uſeful in ſcorbutic and gouty diſeaſes.
Witham,	Eſſex in England.	Aerated iron, and common ſalt.	Diuretic, alterative, and corroborant.
Wirkſworth,	Derbyſhire in England.	Sulphur, purging ſalt, and aerated iron.	Uſeful in ſcrofulous and cutaneous diſeaſes.
Zahorovice,	Germany.	Similar to Nezdenice water.	Much eſteemed in ſcrofulous caſes.

MINEHEAD, a town of Somerſetſhire, 166 miles from London. It is an ancient borough, with a harbour in the Briſtol channel, near Dunſter caſtle, much frequented by paſſengers to and from Ireland. It was incorporated by Queen Eliſabeth, with great privileges, on condition the corporation ſhould keep the quay in repair; but its trade falling off, the quay was neglected, and they loſt their privileges. A ſtatute was obtained in the reign of King William, for recovering the port, and keeping it in repair, by which they were to have the profits of the quay and pier for 36 years, which have been computed at about 200 l. a year; and they were at the expence of new-building the quay. In purſuance of another act, confirming the former, a new head has been built to the quay, the beach cleared, &c. ſo that the biggeſt ſhip may enter, and ride ſafe in the harbour. The town contains about 500 houſes, and 2000 ſouls. It was formerly governed by a portreve, and now by two conſtables choſen yearly at a court-leet held by the lord of the manor. Its chief trade is with Ireland, from whence about 40 veſſels uſed to come hither in a year with wool; and about 4000 chaldrons of coals are yearly imported at this place. Watchet and Poriock, from South Wales, which lies directly oppoſite to it, about ſeven leagues over, the common breadth of this channel all the way from Holmes to the Land's End. Here are ſeveral rich merchants, who have ſome trade alſo to Virginia and the Weſt Indies; and they correſpond much with the merchants of Barneſtaple and Briſtol in their foreign commerce. Three or four thouſand barrels of herrings, which come up the Severn in great ſhoals about Michaelmas, are caught, cured, and ſhipped off here every year, for the Mediterranean, &c. The market here is on Wedneſday, and fair on Whitſun-Wedneſday.

MINERALOGY.

IS that ſcience which teaches us the properties of mineral bodies, and by which we learn how to characteriſe, diſtinguiſh, and claſs them into a proper order.

INTRODUCTION.

Mineralogy ſeems to have been in a manner coeval with the world. Precious ſtones of various kinds appear to have been well known among the Jews and Egyptians in the time of Moſes; and even the moſt rude and barbarous nations appear to have had ſome knowledge of the ores of different metals. As the ſcience is nearly allied to chemiſtry, it is probable that the improvements both in chemiſtry and mineralogy have nearly kept pace with each other; and indeed it is but of late, ſince the principles of chemiſtry were well underſtood, that mineralogy has been advanced to any degree of perfection. The beſt way of ſtudying mineralogy, therefore, is by applying chemiſtry to it; and not contenting ourſelves merely with inſpecting the outſides of bodies, but decompounding them according to the rules of chemiſtry, This method has been brought to the greateſt perfection by Mr Pott of Berlin, and after him by Mr Cronſtedt of Sweden. To obtain this end, chemical experiments in the large way are without doubt neceſſary: but as a great deal of the mineral kingdom has already been examined in this manner, we do not need to repeat all thoſe experiments in their whole extent, unleſs ſome new and particular phenomena ſhould diſcover themſelves in thoſe things we are examining; elſe the tedioufneſs of thoſe proceſſes might diſcourage ſome from going farther, and take up much of the time of others that might be better employed. An eaſier way may therefore be adopted, which even for the moſt part is ſufficient, and which, though made in miniature, is as ſcientifical as the common manner of proceeding in the laboratories, ſince it imitates that, and is founded upon the ſame principles. This conſiſts in making the experiments upon a piece of charcoal with the concentrated flame of a candle directed through a blow-pipe. The heat occaſioned by this is very intenſe; and the mineral bodies may here be burnt, calcined, melted and ſcorified, &c. as well as in any great works.

For a deſcription of the blow-pipe, the method of uſing it, the proper fluxes to be employed, and the different ſubjects of examination to which that inſtrument is adapted, ſee the article *Blow-pipe*, where all thoſe particulars are conciſely detailed. It may not be improper here, however, to reſume thoſe details at greater length; avoiding, at the ſame time, all unneceſſary repetitions. After which we ſhall exhibit a ſcientific arrangement of the mineral kingdom according to the moſt approved ſyſtem.

Part I. EXPERIMENTAL MINERALOGY; with a Description of the Necessary Apparatus (a).

Sect. I. *Of experiments upon Earths amd Stones.*

When any of theſe ſubſtances are to be tried, we muſt not begin immediately with the blow-pipe; but ſome preliminary experiments ought to go before, by which thoſe in the fire may afterwards be directed. For inſtance, a ſtone is not always homogenous, or of the ſame kind throughout, although it may appear to the eye to be ſo. A magnifying glaſs is therefore neceſſary to diſcover the heterogeneous particles, if there be any; and theſe ought to be ſeparated, and every part tried by itſelf, that the effects of two different things, examined together, may not be attributed to one alone. This might happen with ſome of the finer micæ, which are now and then found mixed with ſmall particles of quartz, ſcarcely to be perceived by the eye The trapp (in German *ſchwartzſtein)* is alſo ſometimes mixed with very fine particles of feltſpar *(ſpatam ſcintillans)* or of calcareous ſpar, &c. After this experiment, the hardneſs of the ſtone in queſtion muſt be tried with ſteel. The flint and garnets are commonly known to ſtrike fire with ſteel; but there are alſo other ſtones, which, though very ſeldom, are found ſo hard as likewiſe to ſtrike fire. There is a kind of trapp of that hardneſs, in which no particles of feltſpar are to be ſeen. Coloured glaſſes reſemble true gems; but as they are very ſoft in proportion to theſe, they are eaſily diſcovered by means of the file. The common quartz-cryſtals are harder than coloured glaſſes, but ſofter than the gems. The loadſtone diſcovers the preſence of iron, when it is not mixed in too ſmall a quantity in the ſtone, and often before the ſtone is roaſted. Some kinds of hæmatites, and particularly the cœruleſcens, greatly reſemble ſome other iron ores; but this diſtinguiſhes itſelf from them by a red colour when pounded, the others giving a blackiſh powder, and ſo forth.

The management of the *Blow-pipe* has been deſcribed under that article; but a few particulars may be here recapitulated, or added.

The candle ought to be ſnuffed often, but ſo that the top of the wick may retain ſome fat in it, becauſe the flame is not hot enough when the wick is almoſt burnt to aſhes; but only the top muſt be ſnuffed off, becauſe a low wick gives too ſmall a flame. The blue flame is the hotteſt; this ought, therefore, to be forced out when a great heat is required, and only the point of the flame muſt be directed upon the ſubject which is to be eſſayed. M. Magellan recommends, as being moſt cleanly and convenient, that the candle be made of wax, and the wick ſhould be thicker than ordinary. Its upper end muſt be bended towards the matter intended to be heated, and the ſtream of air muſt be directed along the ſurface of the bended part, ſo as not abſolutely to touch it.

(a) From Engeſtrom's *Treatiſe on the Blow-Pipe*, and Magellan's *Deſcription of Pocket-Laboratories*, &c. ſubjoined to the Engliſh Tranſlation of *Cronſtedt's Mineralogy*, 2d edit. in 2 vols. Dilly.

The piece of charcoal made uſe of in theſe experiments muſt not be of a diſpoſition to crack. If this ſhould happen, it muſt gradually be heated until it does not crack any more, before any aſſay is made upon it. If this be not attended to, but the aſſay made immediately with a ſtrong flame, ſmall pieces of it will ſplit off in the face and eyes of the aſſayer, and often throw along with them the matter that was to be aſſayed. Charcoal which is too much burnt conſumes too quick during the experiment, leaving ſmall holes in it, wherein the matter to be tried may be loſt; and charcoal that is burnt too little, catches flame from the candle, burning by itſelf like a piece of wood, which likewiſe hinders the proceſs.

Of thoſe things that are to be aſſayed, only a ſmall piece muſt be broken off for that purpoſe, not bigger than that the flame of the candle may be able to act upon it at once, if required; which is ſometimes neceſſary, as, when the matter requires to be made red hot throughout, the piece ought to be broken as thin as poſſible, at leaſt the edges; the advantage of which is obvious, the fire having then more influence upon the ſubject, and the experiment being more quickly made.

Some of the mineral bodies are very difficult to be kept ſteady upon the charcoal during the experiment, before they are made red hot; becauſe, as ſoon as the flame begins to act upon them, they ſplit aſunder with violence, and are diſperſed. Such often are thoſe which are of a ſoft conſiſtence or a particular figure, and which preſerve the ſame figure in however minute particles they are broken; for inſtance, the calcareous ſpar, the ſparry gypſum, ſparry fluor, white ſparry lead-ore, the potters ore, the teſſellated mock-lead or blende, &c. even all the common fluors which have no determinate figure. Theſe not being ſo compact as common hard ſtones, when the flame is immediately urged upon them, the heat forces itſelf through and into their clefts or pores, and cauſes this violent expanſion and diſperſion. Many of the clays are likewiſe apt to crack in the fire, which may be for the moſt part aſcribed to the humidity, of which they always retain a portion.

The only way of preventing this inconvenience is to heat the body as ſlowly as poſſible. It is beſt, firſt of all, to heat that place of the charcoal where the piece is intended to be put on; and afterwards lay it thereon; a little crackling will then enſue, but commonly of no great conſequence. After that the flame is to be blown very ſlowly towards it, in the beginning not directly upon, but ſomewhat above it, and ſo approaching nearer and nearer with the flame until it become red hot. This will do for the moſt part; but there are nevertheleſs ſome, which, notwithſtanding all the precautions, it is almoſt impoſſible to keep on the charcoal. Thus the fluors are generally the moſt difficult; and as one of their principal characters is diſcovered by their effects in the fire *per ſe*, they ought neceſſarily to be tried that way. To this purpoſe, it is beſt to make a little hole in the charcoal to put the fluor in, and then to put another piece of charcoal as a covering upon this, leaving only a ſmall opening for the flame to enter. As this ſtone will nevertheleſs ſplit and fly about, a larger piece thereof than is before-mentioned muſt be taken, in order to have at leaſt ſomething of it left.

But if the experiment is to be made upon a ſtone whoſe effects one does not want to ſee in the fire *per ſe*, but rather with fluxes, then a piece of it ought to be forced down into melted borax, when always ſome part of it will remain in the borax, notwithſtanding the greateſt part may ſometimes fly away by cracking.

1. *Of ſubſtances to be tried in the fire* per ſe. As the ſtones undergo great alterations when expoſed to the fire by themſelves, whereby ſome of their characteriſticks, and often the moſt principal, are diſcovered, they ought firſt to be tried that way, obſerving what has been ſaid before concerning the quantity of matter, direction of the fire, &c. The following are generally the reſults of this experiment.

Calcareous earth or *ſtone*, when it is pure, does not melt by itſelf, but becomes white and friable, ſo as to break freely between the fingers; and, if ſuffered to cool, and then mixed with water, it becomes hot, juſt like common quick-lime. As in theſe experiments only very ſmall pieces are uſed, this laſt effect is beſt diſcovered by putting the proof on the outſide of the hand, with a drop of water to it, when inſtantly a very quick heat is felt on the ſkin. When the calcareous ſubſtance is mixed with the vitriolic acid, as in gypſum, or with a clay, as in marle, it commonly melts by itſelf, yet, more or leſs difficultly in proportion to the differences of the mixtures. Gypſum produces generally a white, and marle a grey, glaſs or ſlag. When there is any iron in it, as a white iron ore, it becomes dark, and ſometimes quite black, &c.

The *ſiliciæ* never melt alone, but become generally more brittle after being burnt. Such of them as are coloured become colourleſs, and the ſooner when it does not ariſe from any contained metal; for inſtance, the topazes, amethiſts, &c. ſome of the precious ſtones, however, excepted: And ſuch as are mixed with a quantity of iron grow dark in the fire, as ſome of the jaſpers, &c.

Garnets melt always into a black ſlag, and ſometimes ſo eaſily that they may be brought into a round globule upon the charcoal.

The *argillaceæ*, when pure, never melt, but become white and hard. The ſame effects follow when they are mixed with phlogiſton. Thus the ſoap-rock is eaſily cut with the knife; but being burnt it cuts glaſs, and would ſtrike fire with the ſteel, if as large a piece as is neceſſary for that purpoſe could be tried in this way. The ſoap-rocks are ſometimes found of a dark brown and nearly black colour, but nevertheleſs become quite white in the fire like a piece of China ware. However, care muſt be taken not to urge the flame from the top of the wick, there being for the moſt part a ſooty ſmoke, which commonly will darken all that it touches; and if this is not obſerved, a miſtake in the experiment might eaſily happen. But if

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it is mixed with iron, as it is ſometimes found, it does not ſo eaſily part with its dark colour. The argillaceæ when mixed with lime melt by themſelves, as above-mentioned. When mixed with iron, as in the boles, they grow dark or black; and if the iron is not in too great a quantity, they melt alone into a dark ſlag; the ſame happens when they are mixed with iron and a little of the vitriolic acid, as in the common clay, &c.

Mica and *aſbeſtos* become ſomewhat hard and brittle in the fire, and are more or leſs refractory, though they give ſome marks of fuſibility.

The *fluors* diſcover one of their chief characteriſtics by giving a light like phoſphorus in the dark, when they are ſlowly heated; but loſe this property, as well as their colour, as ſoon as they are made red hot.—They commonly melt in the fire into a white opaque ſlag, though ſome of them not very eaſily.

Some ſorts of the *zeolites* melt eaſily, and foam in the fire, ſometimes nearly as much as borax, and become a frothy ſlag, &c.

A great many of thoſe mineral bodies which are impregnated with iron, as the *boles*, and ſome of the white iron ores, &c. as well as ſome of the other iron ores, viz. the bloodſtone, are not attracted by the loadſtone before they have been thoroughly roaſted, &c.

2. *Of ſubſtances heated with fluxes.* After the mineral bodies have been tried in the fire by themſelves, they ought to be heated with fluxes to diſcover if they can be melted or not, and ſome other phenomena attending this operation. For this purpoſe, three different kinds of ſalts are uſed as fluxes, viz. ſal ſodæ, borax, and ſal fuſible microſmicum; (ſee the article *Blow-Pipe*).

The *ſal ſodæ* is, however, not much uſed in theſe ſmall experiments, its effects upon the charcoal rendering it for the moſt part unfit for it; becauſe, as ſoon as the flame begins to act upon it, it melts inſtantly, and is almoſt wholly abſorbed by the charcoal. When this ſalt is employed to make any experiment, a very little quantity is wanted at once, viz. about the cubical contents of an eighth part of an inch, more or leſs. This is laid upon the charcoal, and the flame blown on it with the blow-pipe; but as this ſalt commonly is in form of a powder, it is neceſſary to go on very gently, that the force of the flame may not diſperſe the minute particles of the ſalt. As ſoon as it begins to melt, it runs along on the charcoal, almoſt like melted tallow; and when cold, it is a glaſſy matter of an opaque dull colour ſpread on the coal. The moment it is melted, the matter which is to be tried ought to be put into it, becauſe otherwiſe the greateſt part of the ſalt will be ſoaked into the charcoal, and too little of it left for the intended purpoſe. The flame ought then to be directed on the matter itſelf; and if the ſalt ſpreads too much about, leaving the proof almoſt alone, it may be brought to it again by blowing the flame on its extremities, and directing it towards the ſubject of the experiment. In the aſſays made with this ſalt, it is true, we may find whether the mineral bodies which are melted with it have been diſſolved by it or not: but we cannot tell with any certitude whether this is done haſtily and with force, or gently and ſlow; nor whether a leſs or a greater part of the matter has been diſſolved: neither can it be well diſtinguiſhed if the matter has imparted any weak tincture to the ſlag; becauſe this ſalt always bubbles upon the charcoal during the experiment, nor is it clear when cool; ſo that ſcarcely any colour, except it be a very deep one, can be diſcovered, although it may ſometimes be coloured by the matter that has been tried.

The following earths are entirely *ſoluble* in this flux with effervеſcence: Agate; chalcedony; carnelian; Turkey ſtone †, (*cos Turcica*); fluor mineralis †; onyx; opal; quartz; common flint; ponderous ſpar. The following are *diviſible* in it with or without effervеſcence, but not entirely ſoluble: Amianthus; aſbeſtus; baſaltes; chryſolite ‡; granate ‡; hornblende; jaſper; marlſtone; mica; the mineral of alum from Tolfa; petroſilex; aluminous ſlate and roof ſlate from Helſingia; emeralds, ſteatites; common flint; ſchoerl; talc; trapp; tripoli; tourmalin. And the following are neither fuſible nor diviſible in it: Diamond; hyacinth; ruby; ſapphire; topaz.

The other two ſalts, viz. *borax* and the *ſal microcoſmicum*, are very well adapted to theſe experiments, becauſe they may by the flame be brought to a clear uncoloured and tranſparent glaſs; and as they have no attraction to the charcoal, they keep themſelves always upon it in a round globular form. The ſal fuſible microcoſmicum § is very ſcarce, and perhaps not to be met with in the ſhops; it is made of urine.

§ See Chemiſtry, nº 905, 906.

The following earths are ſoluble in borax, with more or leſs *effervеſcence*: Fluor mineralis †; marle; mica †; the mineral of alum from Tolfa; aluminous ſlate, and roof-ſlate from Helſingia †; ponderous ſpar; ſchoerl; talc †; tourmalin. And the following *without* effervеſcence; Agate; diamond; amianthus; aſbeſtus; baſaltes; chalcedony; carnelian; chryſolite; cos turcica; granate; hyacinth *; jaſper; lapis ponderoſus; onyx; opal; petro-ſilex; quartz *; ruby; ſapphire; common flint *; ſteatite; trapp; trippel, or tripoli; topaz; zeolite; hydrophanes.

In the microcoſmic ſalt, the following are ſoluble with more or leſs effervеſcence: Baſaltes †; turkey ſtone ‡; fluor mineralis †; marle; mica; the mineral of alum from Tolfa; ſchiſtus aluminaris, ſchiſtus tegularis from Helſingia †; ſchoerl; ſpathum ponderoſum; tourmalin †; lapis ponderoſus. And the following without viſible effervеſcence: Agate; diamond; amianthus; aſbeſtus; chalcedony; carnelian; chryſolite; granate; hyacinth; jaſper; onyx ||; opal; petroſilex; quartz ||; ruby; ſapphire; common flint ||; emerald; talc; topaz; trapp; trippel; zeolite; hornblend; hydrophanes; lithomarga; ſteatites.

Calcareous earth, ponderous ſpar, gypſum, and other additaments, often aſſiſt the ſolution, as well in the microcoſmic ſalt as in borax. To which it is neceſſary to add, that in order to obſerve the effervеſcence properly, the matter added to the flux ſhould be in the form of a ſmall particle rather than in fine powder; becauſe in this laſt there is always air between the particles, which being afterwards driven off by the heat afford the appearance of a kind of effervеſcence (A).

The

(A) In the above liſts, the articles marked † effervеſce very little; thoſe marked ‡ not at all; thoſe marked * require a larger quantity of the flux and a longer continuance of heat than the reſt; thoſe marked || are more difficultly diſſolved than the others.

The quantity of thoſe two ſalts required for an experiment is almoſt the ſame as the *ſal ſodæ*; but as the former are cryſtalliſed, and conſequently include a great deal of water, particularly the borax, their bulk is conſiderably reduced when melted, and therefore a little more of them may be taken than the before mentioned quantity.

Both thoſe ſalts, eſpecially the borax, when expoſed to the flame of the blow-pipe, bubble very much and foam before they melt to a clear glaſs, which for the moſt part depends on the water they contain. And as this would hinder the aſſayer from making due obſervations on the phenomena of the experiment, the ſalt which is to be uſed muſt firſt be brought to a clear glaſs before it can ſerve as a flux; it muſt therefore be kept in the fire until it become ſo tranſparent that the cracks in the charcoal may be ſeen through it. This done, whatſoever is to be tried is put to it, and the fire continued.

Here it is to be obſerved, that for the aſſays made with any of theſe two fluxes on mineral bodies may larger pieces muſt be taken that altogether they, no keep a globular form upon the charcoal; becauſe it may then be better diſtinguiſhed in what manner the flux acts upon the matter during the experiment. If this be not obſerved, the flux, communicating itſelf with every point of the ſurface of the mineral body, ſpreads all over it, and keeps the form of this laſt, which commonly is flat, and by that means hinders the operator obſerving all the phenomena which may happen. Beſides, the flux being in too ſmall a quantity in proportion to the body to be tried, will be too weak to act with all its force upon it. The beſt proportion therefore is about a third part of the mineral body to the flux; and as the quantity of the flux abovementioned makes a globe of a due ſize in regard to the greateſt heat that is poſſible to procure in theſe experiments, ſo the ſize of the mineral body muſt be a third part leſs here than when it is to be tried in the fire by itſelf.

The *ſal ſodæ*, as has been already obſerved, is not of much uſe in theſe experiments; nor has it any particular qualities in preference to the two laſt mentioned ſalts, except that it diſſolves the zeolites eaſier than they do.

The microcoſmic ſalt ſhows almoſt the ſame effects in the fire as the borax, only differing from it in a very few circumſtances; of which one of the principal is, that, when melted with manganeſe, it becomes of a crimſon hue inſtead of a jacinth colour, which borax takes. This ſalt is, however, for its ſcarcity ſtill very little in uſe, borax alone being that which is commonly employed. Whenever a mineral body is melted with any of theſe two laſt mentioned ſalts, in the manner already deſcribed, it is eaſily ſeen, Whether it quickly diſſolves; in which caſe an effervеſcence ariſes, that laſts till the whole be diſſolved: Whether the ſolution be ſlowly performed; in which caſe few and ſmall bubbles only riſe from the matter: or, Whether it can be diſſolved at all; becauſe if not, it is obſerved only to turn round in the flux, without the leaſt bubble, and the edges look as ſharp as they were before.

In order farther to illuſtrate what has been ſaid about theſe experiments, we ſhall give a few examples of the effects of borax upon the mineral bodies.—The *calcareous* ſubſtances, and all thoſe ſtones which contain any thing of lime in their compoſition, diſſolve readily and with effervеſcence in the borax. The effervеſcence is the more violent the greater the portion of lime contained in the ſtone. This cauſe, however, is not the only one in the gypſum, becauſe both the conſtituents of this do readily mix with the borax, and therefore a greater effervеſcence ariſes in melting gypſum with the borax than lime alone.—The *ſiliceæ* do not diſſolve; ſome few excepted which contain a quantity of iron.—The *argillaceæ*, when pure, are not acted upon by the borax: but when they are mixed with ſome heterogeneous bodies, they are diſſolved, though very ſlowly; ſuch are, for inſtance, the ſtone-marrow, the common clay, &c.

The *granates*, *zeolites*, and *trapp*, diſſolve but ſlowly. The *fluors*, *aſbeſtinæ*, and *micaceæ*, diſſolve for the moſt part very eaſily; and ſo forth.—Some of theſe bodies melt to a colourleſs tranſparent glaſs with the borax; for inſtance, the calcareous ſubſtances when pure, the fluors, ſome of the zeolites, &c. Others tinge the borax with a green tranſparent colour, *viz.* the granates, trapp, ſome of the argillaceæ, and ſome of the micaceæ and aſbeſtinæ. This green has its origin partly from a ſmall portion of iron which the granates particularly contain, and partly from phlogiſton.

Borax can only diſſolve a certain quantity of the mineral body proportional to its own. Of the calcareous kind it diſſolves a vaſt quantity; but turns at laſt, when too much has been added, from a clear tranſparent to a white opaque ſlag. When the quantity of the calcareous matter exceeds but little in proportion, the glaſs looks very clear as long as it remains hot: but as ſoon as it begins to cool, a white half opaque cloud is ſeen to ariſe from the bottom, which ſpreads over the third, half, or more of the glaſs globe, in proportion to the quantity of calcareous matter; but the glaſs or ſlag is nevertheleſs ſhining, and of a glaſſy texture when broken. If more of this matter be added, the cloud riſes quicker and is more opaque, and ſo by degrees till the ſlag becomes quite milk white. It is then no more of a ſhining, but rather dry appearance, on the ſurface; is very brittle, and of a grained texture when broken.

SECT. II. *Of Experiments upon Metals and Ores.*

WHAT has been hitherto ſaid relates only to the *ſtones* and *earths*: We ſhall now proceed to deſcribe the manner of examining *metals* and *ores*. An exact knowledge and nicety of procedure are ſo much the more neceſſary here, as the metals are often ſo diſguiſed in their ores, as to be very difficultly known by their external appearance, and liable ſometimes to be miſtaken one for the other: Some of the cobalt ores, for inſtance, reſemble much the *pyrites arſenicalis*; there are alſo ſome iron and lead ores, which are nearly like one another, &c.

As the ores generally conſiſt of metals mineraliſed with ſulphur or arſenic, or ſometimes both together, they ought firſt to be expoſed to the fire by themſelves, in order not only to determine with which of theſe they are mineraliſed, but alſo to ſet them free from thoſe volatile mineraliſing bodies: This ſerves inſtead of calcination, by which they are prepared for further aſſays.

Here it muſt be repeated, that whenever any metal or fuſible ore is to be tried, a little concavity muſt be made in that place of the charcoal where the matter is to be put; becauſe, as ſoon as it is melted, it forms itſelf into a globular figure, and might then roll from the charcoal, if its ſurface was plain; but when borax is put to it, this inconvenience is not ſo much to be feared.

Whenever an ore is to be tried, a ſmall bit being broke off for the purpoſe, it is laid upon the charcoal, and the flame blown on it ſlowly. Then the ſulphur or arſenic begins to part from it in form of ſmoke: theſe are eaſily diſtinguiſhed from one another by their ſmell; that of ſulphur being ſufficiently known, and the arſenic ſmelling like garlick. The flame ought to be blown very gently as long as any ſmoke is ſeen to part from the ore; but after that, the heat muſt be augmented by degrees, in order to make the calcination as perfect as poſſible. If the heat be applied very ſtrongly from the beginning upon an ore that contains much ſulphur or arſenic, the ore will preſently melt, and yet loſe very little of its mineraliſing bodies, by that means rendering the calcination very imperfect. It is, however, impoſſible to calcine the ores in this manner to the utmoſt perfection, which is eaſily ſeen in the following inſtance, *viz.* in melting down a calcined potter's ore with borax, it will be found to bubble upon the coal, which depends on the ſulphur which is ſtill left, the vitriolic acid of this uniting with the borax, and cauſing this motion. However, lead in its metallic form, melted in this manner, bubbles upon the charcoal, if any ſulphur remains in it. But as the lead as well as ſome of the other metals, may raiſe bubbles upon the charcoal, although they are quite free from the ſulphur, only by the flames being forced too violently on it, theſe phenomena ought not to be confounded with each other.

The ores being thus calcined, the metals contained in them may be diſcovered, either by being melted alone or with fluxes; when they ſhow themſelves either in their pure metallic ſtate, or by tinging the ſlag with a colour peculiar to each of them. In theſe experiments it is not to be expected that the quantity of metal contained in the ore ſhould be exactly determined; this muſt be done in larger laboratories. This cannot, however, be looked upon as any defect, ſince it is ſufficient for a mineralogiſt only to find out what ſort of metal is contained in the ore. There is another circumſtance, which is a more real defect in the miniature laboratories, which is, that ſome ores are not at all capable of being tried by ſo ſmall an apparatus; for inſtance, the gold ore called *pyrites aureus*, which conſiſts of gold, iron, and ſulphur. The greateſt quantity of gold which this ore contains is about one ounce, or one ounce and an half, out of 100 pounds of the ore, the reſt being iron and ſulphur: and as only a very ſmall bit is allowed for theſe experiments, the gold contained therein can hardly be diſcerned by the eye, even if it could be extracted; but it goes along with the iron in the ſlag, this laſt metal being in ſo large a quantity in proportion to the other, and both of them having an attraction for each other.

The blendes, or black-jacks, which are mineral zinc ores, containing zinc, ſulphur, and iron, cannot be tried this way, becauſe they cannot be perfectly calcined, and beſides the zinc flies off when the iron ſcorifies. Neither can thoſe blendes, which contain ſilver or gold mineraliſed with them, be tried in this manner, which is particularly owing to the imperfect calcination. Nor are the quickſilver ores fit for theſe experiments: the volatility of that ſemimetal making it impoſſible to bring it out of the poorer ſort of ores: and the rich ores, which ſweat out the quickſilver when kept cloſe in the hand, not wanting any of theſe aſſays, &c. Theſe ores ought to be aſſayed in larger quantities, and even with ſuch other methods as cannot be applied upon a piece of charcoal.

Some of the rich ſilver ores are eaſily tried: for inſtance, *minera argenti vitrea*, commonly called *ſilver-glaſs*, which conſiſts only of ſilver and ſulphur. When this ore is expoſed to the flame, it melts inſtantly, and the ſulphur goes away in fume, leaving the ſilver pure upon the charcoal in a globular form. If this ſilver ſhould happen to be of a dirty appearance, which often is the caſe, then it muſt be melted anew with a very little borax; and after it has been kept in fuſion for a minute or two, ſo as to be perfectly melted and red-hot, the proof is ſuffered to cool: it may then be taken off the coal; and being laid upon the ſteel-plate †, the ſilver is ſeparated from the ſlag by one or two ſtrokes of the hammer †. Here the uſe of the braſs ring† is manifeſt; for this ought firſt to be placed upon the plate, to hinder the proof from flying off by the violence of the ſtroke, which otherwiſe would happen. The ſilver is then found incloſed in the ſlag of a globular form, and quite ſhining, as if it was poliſhed. When a large quantity of ſilver is contained in a lead ore, *viz.* in a potter's ore, it can likewiſe be diſcovered through the uſe of the blow-pipe, of which more will be mentioned hereafter.

† See the article Blow-Pipe and Plate XCIX.

Tin may be melted out of the pure tin ores in its metallic ſtate. Some of theſe ores melt very eaſily, and yield their metal in quantity, if only expoſed to the fire by themſelves: but others are more refractory; and as theſe melt very ſlowly, the tin, which ſweats out in form of very ſmall globules, is inſtantly burnt to aſhes before theſe globules have time to unite in order to compoſe a larger globe, which, might be ſeen by the eye, and not ſo ſoon deſtroyed by the fire; it is therefore neceſſary to add a little borax to theſe from the beginning, and then to blow the flame violently at the proof. The borax does here preſerve the metal from being too ſoon calcined, and even contributes to the readier collecting of the ſmall metalic particles, which ſoon are ſeen to form themſelves into a globule of metallic tin at the bottom of the whole maſs, neareſt to the charcoal. As ſoon as ſo much of the metallic tin is produced as is ſufficient to convince the operator of its preſence, the fire ought to be diſcontinued, though the whole of the ore be not yet melted; becauſe the whole of this kind of ore can be ſeldom or never reduced into metal by means of theſe experiments, a great proportion being always calcined: and if the fire is continued too long, perhaps even the metal already reduced may likewiſe be burnt to aſhes; for the tin is very ſoon deprived of its metallic ſtate by the fire.

Moſt part of the lead ores may be reduced to a metallic ſtate upon the charcoal. The *mineræ plumbi calciformes*, which are pure, are eaſily melted into lead;

but ſuch of them as are mixed with an *ochra ferri*, or any kind of earth, as clay, lime, &c. yield very little of lead, and even nothing at all, if the heterogenea are combined in any large quantity: this happens even with the *minera plumbi calciformis arſenico mixta*. Theſe therefore are not to be tried but in larger laboratories. However, every mineral body ſuſpected to contain any metallic ſubſtance may be tried by the blow-pipe, ſo as to give ſufficient proofs whether it contain any or not, by its effects being different from thoſe of the ſtones or earths, &c.

The *mineræ plumbi mineraliſatæ* leave the lead in a metallic form, if not too large a quantity of iron is mixed with it. For example, when a teſſellated or ſteel-grained lead ore is expoſed to the flame, its ſulphur, and even the arſenic if there be any, begins to fume, and the ore itſelf immediately to melt into a globular form; the reſt of the ſulphur continues then to fly off, if the flame be blown ſlowly upon the maſs; but, on the contrary, very little of the ſulphur will go off, if the flame be forced violently on it: in this caſe, it rather happens that the lead itſelf crackles and diſſipates, throwing about very minute metallic particles. The ſulphur being driven out as much as poſſible, which is known by finding no ſulphureous vapour in ſmelling at the proof, the whole is ſuffered to cool, and then a globule of metallic lead will be left upon the coal. If any iron is contained in the lead-ore, the lead, which is melted out of it, is not of a metallic ſhining, but rather of a black and uneven, ſurface: a little borax muſt in this caſe be melted with it, and as ſoon as no bubble is ſeen to riſe any longer from the metal into the borax, the fire muſt be diſcontinued: when the maſs is grown cold, the iron will be found ſcorified with the borax, and the lead left pure and of a ſhining colour.

Borax does not ſcorify the lead in theſe ſmall experiments when it is pure: if the flame is forced with a violence on it, a bubbling will enſue, reſembling that which is obſerved when borax diſſolves a body melted with it; but when the fire ceaſes, the ſlag will be perfectly clear and tranſparent, and a quantity of very minute particles of lead will be ſeen ſpread about the borax, which have been torn off from the maſs during the bubbling.

If ſuch a lead ore is rich in ſilver, this laſt metal may likewiſe be diſcovered by this experiment; becauſe as the lead is volatile, it may be forced off, and the ſilver remain. To effect this, the lead, which is melted out of the ore, muſt be kept in conſtant fuſion with a ſlow heat, that it may be conſumed. This end will be ſooner obtained, and the lead part quicker, if during the fuſion the wind through the blow-pipe be directed immediately, though not forcibly, upon the melted maſs itſelf, until it begin to cool; at which time the fire muſt be directed on it again. The lead, which is already in a volatiliſing ſtate, will by this artifice be driven out in form of a ſubtil ſmoke; and by thus continuing by turns to melt the maſs, and then to blow off the lead, as has been ſaid, until no ſmoke is any longer perceived, the ſilver will at laſt be obtained pure. The ſame obſervation holds good here alſo, which was made about the gold, that, as none but very little bits of ores can be employed in theſe experiments, it will be difficult to extract the ſilver out of a poor ore: for ſome part of it will fly off with the lead, and what might be left is too ſmall to be diſcerned by the eye. The ſilver, which by this means is obtained, is eaſily diſtinguiſhed from lead by the following external marks, *viz.* that it muſt be red-hot before it can be melted: it cools ſooner than lead: it has a ſilver colour; that is to ſay, brighter and whiter than lead: and is harder under the hammer.

The *mineræ cupri calciformes* (at leaſt ſome of them), when not mixed with too much ſtone or earth, are eaſily reduced to copper with any flux; if the copper is found not to have its natural bright colour, it muſt be melted with a little borax, which purifies it. Some of theſe ores do not all diſcover their metal if not immediately melted with borax; the heterogenea contained in them hindering the fuſion before theſe are ſcorified by the flux.

The grey copper ores, which only conſiſt of copper and ſulphur, are tried almoſt in the ſame manner as abovementioned. Being expoſed to the flame by themſelves, they will be found inſtantly to melt, and part of their ſulphur to go off. The copper may afterwards be obtained in two ways: the one, by keeping the proof in fuſion for about a minute, and afterwards ſuffering it to cool; when it will be found to have a dark and uneven appearance externally, but which after being broken diſcovers the metallic copper of a globular form in its centre, ſurrounded with a regulus, which ſtill contains ſome ſulphur and a portion of the metal: the other, by being melted with borax, which laſt way ſometimes makes the metal appear ſooner.

The *mineræ cupri pyritaceæ*, containing copper, ſulphur, and iron, may be tried with the blow-pipe if they are not too poor. In theſe experiments the ore ought to be calcined, and after that the iron ſcorified. For this purpoſe a bit of the ore muſt be expoſed to a ſlow flame, that as much of the ſulphur as poſſible may part from it before it is melted, becauſe the ore commonly melts very ſoon, and then the ſulphur is more difficultly driven off. After being melted, it muſt be kept in fuſion with a ſtrong fire for about a minute, that a great part of the iron may be calcined; and after that, ſome borax muſt be added, which ſcorifies the iron, and turns with it to a black ſlag. If the ore is very rich, metallic copper will be had in the ſlag after the ſcorification. If the ore be of a moderate richneſs, the copper will ſtill retain a little ſulphur, and ſometimes iron: the product will therefore be brittle, and muſt with great caution be ſeparated from the ſlag, that it may not break into pieces; and if this product is afterwards treated in the ſame manner as before ſaid, in ſpeaking of the grey copper-ores, the metal will ſoon be produced. But if the ore is poor, the product after the firſt ſcorification muſt be brought into fuſion, and afterwards melted with ſome freſh borax, in order to calcine and ſcorify the remaining portion of iron; after which it may be treated as mentioned in the preceding paragraph. The copper will in this laſt caſe be found in a very ſmall globule.

The copper is not very eaſily ſcorified with this apparatus, when it is melted together with borax, unleſs it has firſt been expoſed to the fire by itſelf for a while in order to be calcined. When only a little of this metal is diſſolved, it inſtantly tinges the ſlag of a red-

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diſh brown colour, and moſtly opaque; but as ſoon as this ſlag is kept in fuſion for a little while, it becomes quite green and tranſparent: and thus the preſence of the copper may be diſcovered by the colour, when it is concealed in heterogeneous bodies, ſo as not to be diſcovered by any other experiment.

If metallic copper is melted with borax by a ſlow fire, and only for a very little time, the glaſs or ſlag becomes of a fine tranſparent blue or violet colour, inclining more or leſs to the green: but this colour is not properly owing to the copper, but it may rather be to its phlogiſton; becauſe the ſame colour is to be had in the ſame manner from iron; and theſe glaſſes, which are coloured with either of thoſe two metals, ſoon loſe their colour if expoſed to a ſtrong fire, in which they become quite clear and colourleſs. Beſides, if this glaſs, tinged blue with the copper, is again melted with more of this metal, it becomes of a good green colour, which for a long time keeps unchanged in the fire.

The iron ores, when pure, can never be melted *per ſe*, by the means of the blow-pipe alone; nor do they yield their metal when melted with fluxes; becauſe they require too ſtrong a heat to be brought into fuſion; and as both the ore and the metal itſelf very ſoon loſe their phlogiſton in the fire, and cannot be ſupplied with a ſufficient quantity from the charcoal, ſo likewiſe they are very ſoon calcined in the fire. This eaſy calcination is alſo the reaſon why the fluxes, for inſtance borax, readily ſcorify this ore, and even the metal itſelf. The iron loſes its phlogiſton in the fire ſooner than the copper, and is therefore more eaſily ſcorified.

The iron is, however, diſcovered without much difficulty, although it were mixed but in a very ſmall quantity with heterogeneous bodies. The ore, or thoſe bodies which contain any large quantity of the metal, are all attracted by the loadſtone, ſome without any previous calcination, and others without having being roaſted. When a clay is mixed with a little iron, it commonly melts by itſelf in the fire; but if this metal is contained in a limeſtone; it does not promote the fuſion, but gives the ſtone a dark and ſometimes a deep black colour, which always is the character of iron. A *minera ferri calciformis pura cryſtallifata*, is commonly of a red colour: This being expoſed to the flame, becomes quite black; and is then readily attracted by the loadſtone, which it was not before. Beſides theſe ſigns, the iron diſcovers itſelf, by tinging the ſlag of a green tranſparent colour, inclining to brown, when only a little of the metal is ſcorified; but as ſoon as any larger quantity thereof is diſſolved in the ſlag, this becomes firſt a blackiſh brown, and afterwards quite black and opaque.

Biſmuth is known by its communicating a yellowiſh brown colour to borax; and arſenic by its volatility and garlick ſmell. Antimony, both in form of regulus and ore, is wholly volatile in the fire when it is not mixed with any other metal except arſenic; and is known by its particular ſmell, eaſier to be diſtinguiſhed when once known than deſcribed. When the ore of antimony is melted upon the charcoal, it bubbles conſtantly during its volatiliſing.

Zinc ores are not eaſily tried upon the coal; but the regulus of zinc expoſed to the fire upon the charcoal burns with a beautiful blue flame, and forms itſelf almoſt inſtantly into white flowers, which are the common flowers of zinc.

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Cobalt is particularly remarkable for giving to the glaſs a blue colour, which is the zaffre or ſmalt. To produce this, a piece of cobalt ore muſt be calcined in the fire, and afterwards melted with borax. As ſoon as the glaſs, during the fuſion, from being clear, ſeems to grow opaque, it is a ſign that it is already tinged a little; the fire is then to be diſcontinued, and the operator muſt take hold, with the nippers, of a little of the glaſs, whilſt yet hot, and draw it out ſlowly in the beginning, but afterwards very quick, before it cools, whereby a thread of the coloured glaſs is procured, more or leſs thick, wherein the colour may eaſier be ſeen than in a globular form. This thread melts eaſily, if only put in the flame of the candle without the help of the blow-pipe.—If this glaſs be melted again with more of the cobalt, and kept in fuſion for a while, the colour becomes very deep; and thus the colour may be altered at pleaſure.

When the cobalt ore is pure, or at leaſt contains but little iron, a cobalt regulus is almoſt inſtantly produced in the borax during the fuſion; but when it is mixed with a quantity of iron, this laſt metal ought firſt to be ſeparated, which is eaſily performed ſince it ſcorifies ſooner than the cobalt; therefore, as long as the ſlag retains any brown or black colour, it muſt be ſeparated, and melted again with freſh borax, until it ſhows the blue colour.

Nickel is very ſeldom to be had; and as its ores are ſeldom free from mixtures of other metals, it is very difficultly tried with the blow-pipe. However, when this ſemimetal is mixed with iron and cobalt, it is eaſily freed from theſe heterogeneous metals, and reduced to a pure nickel regulus by means of ſcorification with borax, becauſe both the iron and cobalt ſooner ſcorify than the nickel. The regulus of nickel itſelf is of a green colour when calcined: it requires a pretty ſtrong fire before it melts, and tinges the borax with a hyacinth colour. Manganeſe gives the ſame colour to borax; but its other qualities are quite different, ſo as not to be confounded with the nickel.

By means of the foregoing explanations, and thoſe given under the article *Blow-Pipe*, any gentleman, who is a lover of this ſcience, will be able, in an eaſy manner, to amuſe himſelf in diſcovering the properties of thoſe works of nature, with which the mineral kingdom furniſhes us; or more uſefully to employ himſelf by finding out what ſorts of ſtones, earths, ores, &c. there are on his eſtate, and to what economical purpoſes they may be employed. The ſcientific mineraliſt may, by examining into the properties and effects of the mineral bodies, diſcover the natural relation theſe bodies ſtand in to each other, and thereby furniſh himſelf with materials for eſtabliſhing a mineral ſyſtem, founded on ſuch principles as Nature herſelf has laid down in them; and this in his own ſtudy, without being forced to have recourſe to great laboratories, crucibles, furnaces, &c. which is attended with much trouble, and is the reaſon why ſo few can have an opportunity of gratifying their deſire of knowledge in

Portable Apparatus. this part of natural hiſtory. Farther improvements of this apparatus may ſtill be made by thoſe who chooſe to beſtow their attention upon it.

A great number of fluxes might, perhaps, be found out, whoſe effects might be different from thoſe already in uſe, whereby more diſtinct characters of thoſe mineral bodies might be diſcovered, which now either ſhow ambiguous ones, or which it is almoſt impoſſible to try exactly with the blow-pipe. Inſtead of the *ſal ſodæ*, ſome other ſalt might be diſcovered better adapted to theſe experiments. But it is very neceſſary not to make uſe of any other fluxes on the charcoal than ſuch as have no attraction to it: if they, at the ſame time, be clear and tranſparent, when melted, as the borax and the *ſal fuſibile microcoſmicum*, it is ſtill better: however, the tranſparency and opacity are of no great conſequence, if a ſubſtance be aſſayed only in order to diſcover its fuſibility, without any attention to its colour; in which caſe, ſome metallic ſlag, perhaps, might be uſeful.

When ſuch ores are to be reduced whoſe metals are very eaſily calcined, as tin, zinc, &c. it might perhaps be of ſervice to add ſome phlogiſtic body, ſuch as hard reſin, ſince the charcoal cannot afford enough of it in the open fire of theſe aſſays. The manner of melting the volatile metals out of their ores *per deſcenſum* might alſo, perhaps, be imitated: for inſtance, a hole might be made in the charcoal, wide above and very narrow at the bottom; a little piece of the ore being then laid at the upper end of the hole, and covered with ſome very ſmall pieces of the charcoal, the flame muſt be directed on the top: the metal might, perhaps, by this method, run into the hole below, concealed from the violence of the fire, particularly if the ore is very fuſible, &c.

The uſe of the apparatus above referred to, and which may be called a *pocket laboratory* (as the whole admits of being eaſily packed into a ſmall caſe), is chiefly calculated for a travelling mineraliſt. But a perſon who always reſides at one and the ſame place, may by ſome alteration make it more commodious to himſelf, and avoid the trouble of blowing with the mouth. For this purpoſe he may have the blow-pipe go through a hole in a table, and fixed underneath to a ſmall pair of bellows with double bottoms, ſuch as ſome of the glaſs-blowers uſe, and then nothing more is required than to move the bellows with the feet during the experiment; but in this caſe a lamp may be uſed inſtead of a candle. This method would be attended with a ſtill greater advantage, if there were many ſuch parts as *c*, fig. 13. the openings of which were of different dimenſions: thoſe parts might by means of a ſcrew be faſtened to the main body of the blow-pipe, and taken away at pleaſure. The advantage of having theſe nozzles of different capacities at their ends, would be that of exciting a ſtronger or weaker heat as occaſion might require. It would only be neceſſary to obſerve, that in proportion as the opening or nozzle of the pipe is enlarged, the quantity of the flame muſt be augmented by a thicker wick in the lamp, and the force of blowing encreaſed by means of weights laid on the bellows; a much intenſer heat would thus be produced by a pipe of a conſiderable opening at the end, by which the experiments muſt undoubtedly be carried farther than the common blow-pipe.

Plate CCCXIII.

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A traveller, who has ſeldom an opportunity of carrying many things along with him, may very well be contented with this laboratory and its apparatus, which are ſufficient for moſt part of ſuch experiments as can be made on a journey. There are, however, other things very uſeful to have at hand on a journey, which ought to make a ſeparate part of a portable laboratory, if the manner of travelling does not oppoſe it: this conſiſts of a little box including the different acids, and one or two matraſſes, in order to try the mineral bodies in liquid menſtrua if required.

Theſe acids are, the acid of nitre, of vitriol, and of common ſalt. Moſt of the ſtones and earths are attacked, at leaſt in ſome degree, by the acids; but the calcareous are the eaſieſt of all to be diſſolved by them, which is accounted for by their calcareous properties. The acid of nitre is that which is moſt uſed in theſe experiments; it diſſolves the limeſtone, when pure, perfectly, with a violent efferveſcence, and the ſolution becomes clear: when the limeſtone enters into ſome other body, it is nevertheleſs diſcovered by this acid, through a greater or leſs efferveſcence in proportion to the quantity of the calcareous particles, unleſs there are ſo few as to be almoſt concealed from the acid by the heterogeneous ones. In this manner a calcareous body, which ſometimes nearly reſembles a ſiliceous or argillaceous one, may be known from theſe latter, without the help of the blow-pipe, only by pouring one or two drops of this acid upon the ſubject; which is very convenient when there is no opportunity nor time of uſing this inſtrument.

The gypſa, which conſiſt of lime and the vitriolic acid, are not in the leaſt attacked by the acid of nitre, if they contain a ſufficient quantity of their own acid; becauſe the vitriolic acid has a ſtronger attraction to the lime than the acid of nitre: but if the calcareous ſubſtance is not perfectly ſaturated with the acid of vitriol, then an efferveſcence ariſes with the acid of nitre, more or leſs in proportion to the want of the vitriolic acid. Theſe circumſtances are often very eſſential in diſtinguiſhing the *calcarea* and *gypſa* from one another.

The acid of nitre is likewiſe neceſſary in trying the zeolites, of which ſome ſpecies have the ſingular effect to diſſolve with efferveſcence in the abovementioned acid; and within a quarter of an hour, or even ſometimes not until ſeveral hours after, to change the whole ſolution into a clear jelly, of ſo firm a conſiſtence, that the glaſs wherein it is contained may be reverſed without its falling out.

If any mineral body is tried in this menſtruum, and only a ſmall quantity is ſuſpected to be diſſolved, though it was impoſſible to diſtinguiſh it with the eye during the ſolution, it can be eaſily diſcovered by adding to it *ad ſaturitatem* a clear ſolution of the alkali, when the diſſolved part will be precipitated, and fall to the bottom. For this purpoſe the *ſal ſodæ* may be very uſeful.

The acid of nitre will ſuffice for making experiments upon ſtones and earths; but if the experiments are to be extended to the metals, the other two acids are alſo neceſſary.

Another inſtrument is likewiſe neceſſary to a

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complete Pocket Laboratory, viz. a waſhing-trough (fig. 21.), in which the mineral bodies, and particularly the ores, may be ſeparated from each other, and from the adherent rock, by means of water. This trough is very common in laboratories, and is uſed of different ſizes; but here only one is required of a moderate ſize, ſuch as 12 inches and a half long, three inches broad at the one end and one inch and a half at the other end, ſloping down from the ſides and the broad end to the bottom, where it is three quarters of an inch deep. It may, however, be made of much ſmaller dimenſions. It is commonly made of wood, which ought to be choſen ſmooth, hard, and compact, wherein are no pores in which the minute grains of the pounded matter may conceal themſelves. It is to be obſerved, that if any ſuch matter is to be waſhed as is ſuſpected to contain ſome native metal, ſuch as ſilver or gold, a trough ſhould be procured for this purpoſe of a very ſhallow ſlope; becauſe the minute particles of the native metal have then more power to aſſemble together at the broad end, and ſeparate from the other matter.

The management of this trough, or the manner of waſhing, conſiſts in this: That when the matter is mixed with about three or four times its quantity of water in the trough, this is kept very looſe between two fingers of the left hand, and ſome light ſtrokes given on its broad end with the right, that it may move backwards and forwards; by which means the heavieſt particles aſſemble at the broad and lower end, from which the lighter ones are to be ſeparated by inclining the trough and pouring a little water on them. By repeating this proceſs, all ſuch particles as are of the ſame gravity may be collected together, and ſeparated from thoſe of different gravity, provided they were before equally pounded: though ſuch as are of a clayey nature, are often very difficult to ſeparate from the reſt, which, however, is of no great conſequence to a ſkilful and experienced waſher. The waſhing proceſs is very neceſſary, as there are often rich ores, and even native metals, found concealed in earths and ſand in ſuch minute particles as not to be diſcovered by any other means.

Sect. III. *Deſcription of an Improved Portable Laboratory for aſſaying Minerals.*

The chief pieces and implements of the portable laboratories are repreſented in Plate XCIX. at *Blow-Pipe*, and in Plate CCCXIII. annexed to the preſent article.

I. The firſt contains thoſe belonging to the *Dry* Laboratory, ſo called on account of its containing whatever is required to try all kinds of foſſils in the dry way by fire, without any of the humid menſtruums. They are made to pack in a box of the ſize of an octavo book, lined with green velvet, and covered with black fiſh-ſkin; the inſide divided into different compartments, ſuited to the ſize, form, and number of the implements it is to contain. Of theſe the principal are deſcribed under *Blow-Pipe.* We muſt here, however, add the following remarks and alterations of that inſtrument by Mr Magellan.

Plate CCCXIII.

D and Q (fig. 13.) are the two pieces that form the blow-pipe, which is here repreſented entire. This very uſeful inſtrument has been conſiderably improved of late in England. The mouth-piece *aa* is made of ivory, to avoid the diſagreeable ſenſation of having a piece of metal a long time between the teeth and lips, which, if not of ſilver or gold, may be very noxious to the operator; a circumſtance that has been hardly noticed before.

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1. If the mouth-piece *aa* be made of a round form, it cannot be held for any length of time between the teeth and lips, to blow through it, without ſtraining the muſcles of the mouth, which produces a painful ſenſation. It muſt, therefore, have ſuch an external figure, as to adapt itſelf accurately to the lateral angles of the lips, having a flattiſh oval form externally, with two oppoſite corners to fit thoſe internal angles of the mouth, when it is held between the lips, as may be ſeen in that repreſented in the figure.

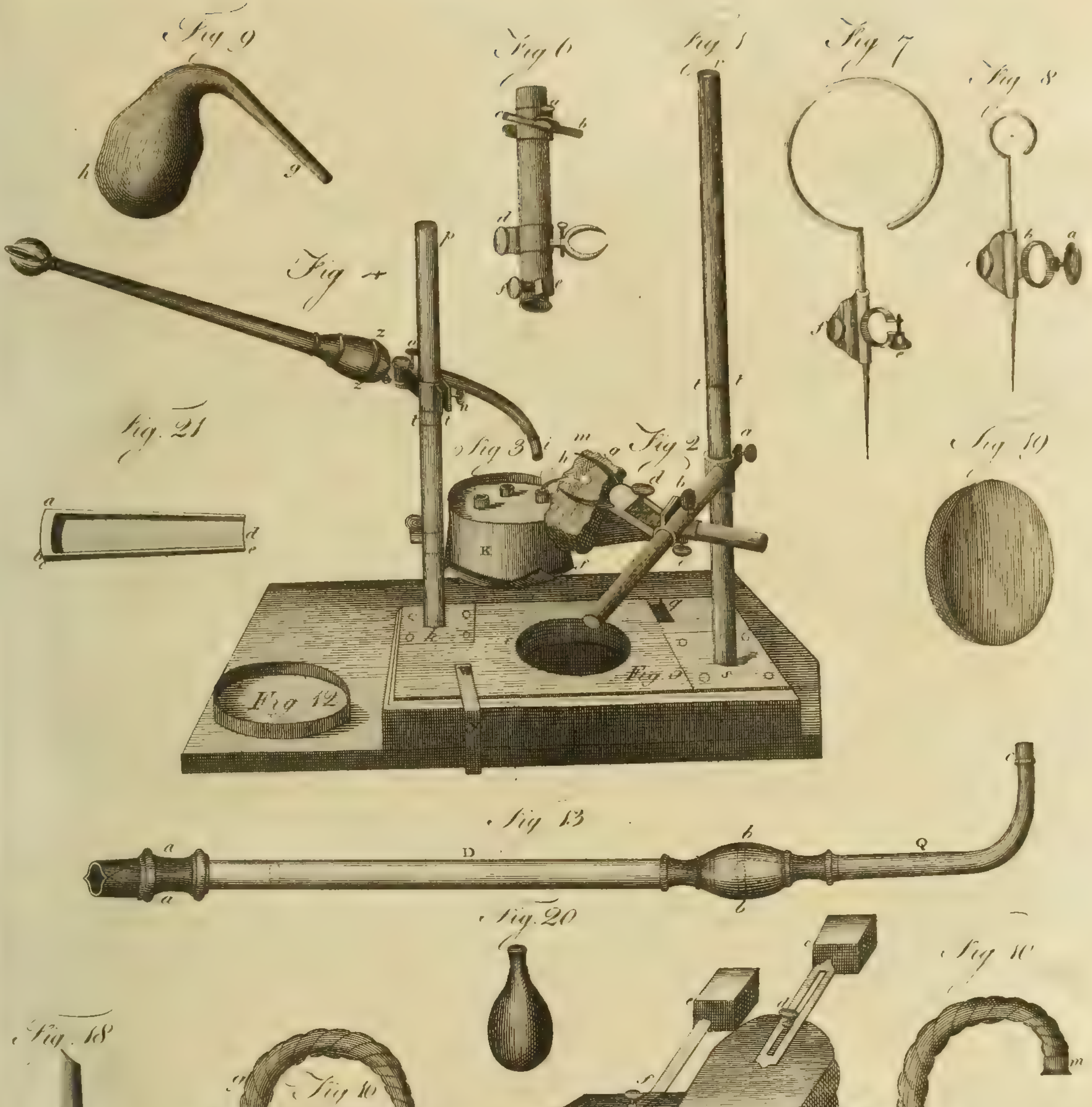
2. The ſmall globe *bb* is hollow, for receiving the moiſture of the breath; and muſt be compoſed of two hemiſpheres, exactly ſcrewing into one another in *bb*; the male-ſcrew is to be in the lower part, and ſoldered on the crooked part Q of the tube QD, at ſuch a diſtance, that the inſide end of the crooked tube be even with the edge of the hemiſphere, as repreſented by the pointed lines in the figure. But the upper hemiſphere is to be ſoldered at the end of the ſtraight tube D. By theſe means, the moiſture ariſing from the breath falls into the hollow of the lower hemiſphere, where it is collected round the upper inſide end of the crooked part Q of the blow-pipe, without being apt to fall into it.

3. The ſmall nozzles, or hollow conical tubes, adviſed by Meſſrs Engeſtrom, Bergman, and others, are wrong in the principle; becauſe the wind that paſſes from the mouth through ſuch long cones loſes its velocity by the lateral friction, as happens in hydraulic ſpouts; which, when formed in this manner, do never throw the fluid ſo far as when the fluid paſſes through a hole of the ſame diameter, made in a thin plate of a little metallic cap that ſcrews at the end of the large pipe. It is on this account that the little cap *c* is employed, having a ſmall hole in the thin plate, which ſerves as a cover to it; and there are ſeveral of theſe little caps, with holes of ſmaller and larger ſizes, to be changed and applied whenever a flame is required to be more or leſs ſtrong.

4. Another convenience of theſe little caps is, that even in caſe any moiſture ſhould eſcape falling into the hemiſphere *bb*, and paſs along with the wind through the crooked pipe Q, it never can arrive at nor obſtruct the little hole of the cap *c*, there being room enough under the hole in the inſide, where this moiſture muſt be ſtopped till it is cleaned and wiped out.

The ſtream of air that is impelled by the blow-pipe (as ſeen in fig. 3.) upon the flame, muſt be conſtant and even, and muſt laſt as long as the experiment continues to require it. This labour will fatigue the lungs, unleſs an equable and uninterrupted inſpiration can at the ſame time be continued. To ſucceed in this operation without inconvenience, ſome labour and practice are neceſſary, as already explained under the detached article.

Every aſſay ought always to begin by the exterior flame, which muſt be firſt directed upon the maſs under examination; and, when its efficacy is well known, then the interior blue flame is to be employed.



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After the ore is roaſted, it is to be rounded upon the ſteel plate by the hammer; the particles being prevented from being diſſipated by the ring H (*fig.* 9, Plate XCIX.), within which the pieces to be broken are to be put.

Among the apparatus, beſide the particulars already mentioned, three phials are neceſſary, containing the required fluxes, viz. the *borax*, the *ſal ſodæ*, and *ſal fuſibile microcoſmicum*. Other uſeful particulars are, A ſmall link of hard ſteel, to try the hardneſs or ſoftneſs of mineral ſubſtances, and alſo to ſtrike fire for lighting the candle when required: A piece of black flint, to ſerve as a touch-ſtone; (for being rubbed with any metal, if it be gold the marks will not be corroded by aqua fortis); and alſo to ſtrike fire, when neceſſary, with the link of ſteel: An artificial loadſtone, properly armed with iron, for the better preſervation of its attractive power; (it ſerves to diſcover the ferrugineous particles of any ore after it has been roaſted and powdered:) A triple magnifier, which, differently combined, produces ſeven magnifying powers, the better to diſtinguiſh the ſtructure and metallic parts of ores, and the minute particles of native gold, whenever they contain that metal: A file, to try the hardneſs of ſtones and cryſtals, &c.: Some pieces of dry agaric or tinder, and ſmall bits or ſplinters of wood tipped with brimſtone, to ſerve as matches for lighting the candle; and various other little articles of uſe in theſe experiments.

II. For performing experiments in the *Humid Way*, the chief additional articles (and which muſt be kept in a ſeparate caſe) conſiſt of a collection of phials, containing the principal acids, teſts, precipitants, and re-agents, both for examining mineral bodies by the humid way, and for analyſing the various kinds of mineral waters. Thoſe with acids and corroſive ſolutions have not only ground ſtoples, but alſo an external cap to each, ground over the ſtople, and ſecured downward by a bit of wax between both, in order to confine the corroſive and volatile fluids within. But thoſe which contain mild fluid liquors have not ſuch external caps: and thoſe with dry inoffenſive ſubſtances are only ſtopped with cork. Beſides theſe phials, there are two ſmaller cylindrical ones, which ſerve to exhibit the changes of colour produced by ſome of the re-agents in thoſe analytical aſſays. There are alſo two or three ſmall matraſſes, to hold the ſubſtances with their ſolvents over the fire; a ſmall glaſs funnel, for pouring the fluids; a ſmall porcelain mortar, with its peſtle; one or two crucibles of the ſame ſubſtance; a ſmall wooden trough to waſh the ground ores; ſome glaſs ſticks to ſtir up the fluid mixtures; and, finally, pieces of paper tinged red, yellow, and blue, by the tinctures of Fernambuc wood (commonly called Braſil wood), turmeric, and litmus, thickened with a little ſtarch.

The following liſt contains the names of the various fluid teſts and re-agents that are neceſſary for theſe aſſays. But the whole number being too large to be all contained in a portable caſe, every one may give the preference to thoſe he likes beſt.

1. Concentrated vitriolic acid, whoſe ſpecific gravity may be expreſſed in the outſide.
2. Nitrous acid, purified by the nitrous ſolution of ſilver.
3. Concentrated marine acid, with its ſpecific gravity.
4. Marine acid dephlogiſticated.
5. Aqua regia for gold, viz. 2 nit. and 1 marine.
6. Aqua regia for platina viz. half marine and half nitrous acid.
7. Nitrous ſolution of ſilver.
8. Nitrous ſolution of mercury, made in the cold.
9. Muriatic ſolution of barytes.
10. Nitrous ſolution of lime.
11. Muriatic ſolution of lime.
12. Mercury in its metallic ſtate.
13. Corroſive ſublimate of mercury.
14. White arſenic.
15. Nitrous ſolution of ſilver.
16. Nitrous ſolution of copper.
17. Acid of ſugar.
18. Liquor probatorius vini.
19. Hepar ſulphuris.
20. Oil of tartar *per deliquium*.
21. Salt of tartar.
22. Cauſtic vegetable alkali.
23. Pearl-aſhes.
24. Soap-makers ley.
25. Common ſalt.
26. Vitriolated argilla (alum.)
27 Vitriol of iron (copperas)
28. Nitrous ſolution of ſilver.
29. Acetous ſolution of lead.
30. Acetous ſolution of barytes.
31. Phlogiſticated alkali by the Pruſſian blue.
32. Lime-Water.
33. Lime-water phlogiſticated by the Pruſſian blue.
34. Cauſtic volatile alkali.
35. Mild volatile alkali (dry.)
36. Rectified ſpirit (alcohol.
37. Æther.
38. Spirituous tincture of galls.

The following teſts are very fit alſo for theſe aſſays, viz. 39, Spirituous ſolutions of ſoap; 40. Syrup of violets; 41 Tincture of litmus; 42. Tincture of Braſil wood; 43. Tincture of turmeric; 44. Oil of olives; 45. Oil of linſeed: 46. Oil of turpentine; 47. Eſſential ſalt of wild-ſorrel; 48. Hepar ſulphuris: 49. Sugar of lead; 50. Solution of alum.

The method of applying the above teſts of acids and re-agents may be ſeen in Bergman's treatiſes of the Analyſis of Waters, and of Aſſaying by the Humid Way; in Kirwan's Elements of Mineralogy; in the Elements of Chemiſtry of Dijon; in the Memoirs of the ſame Academy; in Fourcroy's Lectures of Chemiſtry, &c.

Portable Apparatus.

III. The *Lamp-furnace* Laboratory, for experiments both by the *humid* and the *dry* way, is a very curious and uſeful, though ſmall apparatus. It is an improvement of that which was contrived by M. de Morveau, in conſequence of the information he received from his friend the preſident de Virly, who ſaw at Upſal how advantageouſly the late eminent profeſſor Bergman availed himſelf of this convenience for many analytical proceſſes in miniature, by the uſe of very ſmall glaſs veſſels about one inch diameter, and other implements of proportional ſize, for performing various chemical operations. (See the Dijon Memoirs for 1783. Part 1. p. 171.)

Portable Apparatus.

There can be no doubt but that whenever theſe proceſſes are properly conducted, though in miniature, the lamp-furnace will prove amply ſufficient to perform in a few minutes, and with very little expence, the various ſolutions, digeſtions, and diſtillations, which otherwiſe would require large veſſels, ſtills, retorts, reverberatory furnaces, &c. to aſcertain the component parts of natural bodies; though it is not always ſufficient to aſcertain their reſpective quantities. In this laſt caſe, operations muſt be performed in great laboratories, and on a large ſcale, at a conſiderable expence. But the ſubſtances are ſometimes too valuable; as, for inſtance, when precious ſtones are examined; and of courſe the laſt way never can be attempted in ſuch caſes.

Theſe ſmall proceſſes have likewiſe another advantage before noticed, which cannot be obtained in works at large. It conſiſts in one's being able to obſerve the gradual progreſs of each operation; of eaſily retarding or urging it, as it may require: and of aſcertaining at pleaſure each ſtep of every experiment, together with the phenomena attending the ſame.

Plate CCCXIII.

The lamp-furnace is mounted in a ſmall parallelogram of mahogany, about ſix inches long and four wide, marked fig. 5. This is kept ſteady over the edge of a common table, by means of the metallic clamp *uvw*, which is faſtened by the ſcrew *x*. The pillar *rs* is ſcrewed in a vertical poſition on the plate *s*, being about ten inches high: the other is ſcrewed to the oppoſite corner, marked *pk*, and is only $7\frac{1}{2}$ inches long; both are compoſed of two halves, that ſcrew at *tt*, to be eaſily packed up with all the implements in a caſe covered with black fiſh ſkin, and lined with green velvet, like the other laboratory already deſcribed.

The lamp *k*, fig. 3. is ſupported on the plate *f*, which has a ring *l* that runs in the column *pk*, and may be fixed by its ſcrew *l* at the required height.—This lamp has three ſmall pipes of different ſizes, to receive as many wicks of different thickneſs, and to be filled with ſpirit of wine. By a ſimilar method, a piece of charcoal is mounted and ſupported by the pliers or little forceps ſcrewed to the arm *ac*, fig. 1. which has all the motions requiſite for being fixed by means of proper ſcrews, at a proper diſtance from the flame of the wick *h*. The blow-pipe, fig. 4. is, by a ſimilar mechaniſm, mounted on the ſmaller column *pq*, at ſuch a diſtance as to blow the flame *hi* to the piece of ore *m*, which is upon the charcoal *gf*.

Every thing being diſpoſed in this manner, the operator blows through the mouth-piece of the blow-pipe, fig. 4. and remains with his hands free to make the changes and alterations he may think proper.—

[*N. B.* The large round cavity *e* in the middle of the parallelogram, fig. 5. is to receive the lamp *k*, fig. 3. when all the implements are packed up in their caſe of black fiſh ſkin: and the cover of the lamp is repreſented by fig. 12.]

But if the operator has the double bellows, fig. 14. and 15. he fixes them, at a due diſtance, to the ſame table by the braſs clamp *y*. He then unſcrews the blow-pipe at *z z*, joins the month *m* of the flexible tube of the hemiſphere *z z*, paſſing each orifice thro' the leather tube fig. 11, and tying both ends with a waxed thin pack-thread. If he works with his foot on the pedal, the ſtring of which is ſeen hanging from the end of the bellows, fig. 15. (and is always up, on account of the weight *e*), then the air is abſorbed by the bellows fig. 15. from whence it is propelled by the motion of the foot on the pedal to the bellows, fig. 14. whoſe conſtant weight *r* drives it out through the flexible pipe, fig. 10. it of courſe enters the curbed part *zzi* of the blow-pipe, and drives the flame on the piece *m* of the ore, that is to be examined upon the charcoal.

[*N. B.* 1. This double bellows is packed up by itſelf in a mahogany caſe, about 9 inches long, $6\frac{1}{2}$ wide, and about $3\frac{1}{4}$ deep, outſide meaſure. 2. The laſt blowing bellows, fig. 14, has an inſide valve, which opens when the upper ſurface of it is at its greateſt height; in order to let the ſuperfluous air eſcape out, as it would otherwiſe iſſue with great velocity out of the tube, fig. 11. and ſpoil the operation.]

If the operator chooſes to apply the vital or dephlogiſticated air in his proceſs, let him fill the glaſs jar *h*, fig. 17. with this air; and put it within the tube marked by *abze*, filled with water, faſtening the neck of the jar within by a croſs-board *ed*, which has a hole in it for that purpoſe: then introducing the two ends of the flexible hollow tube, fig. 16. both to the mouth of the jar and to the hole of the bellows fig. 15. he opens the hole *m* of the jar, that was ſtopped with the ſtopple *n*; the column of the water paſſes in through *m*, and forces up the vital air, which enters the bellows, and of courſe, by the alternate motion of the pedal, paſſes through the end of the blow-pipe, to urge the flame upon the piece of ore *m*, fig. 2. on the charcoal *g*. But the dephlogiſticated air may be alſo received at the ſame time that it is produced, by tying the pipe, fig. 16. to the mouth of an earthen retort, or even of a glaſs retort well-coated, according to the method of Mr Willis, deſcribed in the Tranſactions of the Society of Arts, Vol. V. p. 96. This laſt conſiſts in diſſolving two ounces of borax in a pint of boiling water, and adding to the ſolution as much ſlacked lime as is neceſſary to form a thin paſte. This glaſs retort is to be covered all over with it, by means of a painter's bruſh, and then ſuffered to dry. It muſt then be covered with a thin paſte made of linſeed oil and ſlacked lime, except the neck that enters into the receiver. In two or three days it will dry of itſelf; and the retort will then bear the greateſt fire without cracking. Two ounces of good nitre being urged in the retort, by a good fire on a chafing-diſh, will afford about 700 or 800 ounce-meaſures of dephlogiſticated air.

To make any other kind of chemical aſſays, the forceps of fig. 2. which ſupports the charcoal, is taken off by unſcrewing the ſcrew *b*; the blow-pipe is alſo taken off, by looſening the ſcrew *n*; the hoop fig. 7. is put in its place, where the metallic baſin of fig. 19. is put filled with ſand; the piece of fig. 8. is ſet on the other pillar *rs*, fig. 1. to hold the matraſs, fig. 18. upright, or the receiver fig. 20, &c.

In the ſame manner, the retort, fig. 9. may be put in the ſand-bath inſtead of the matraſs, with its receiver fig. 20. which may be ſupported on a bit of cork or wood, hollowed to its figure, and held by the pliers, inſtead of the charcoal fig. 2.

But if the operation is to be made in the naked fire, the neck of the retort, fig. 9. being luted to the receiver, or balloon, fig. 20. may be hanged by a little chain with its ring over the flame, being ſuſpended from the piece of fig. 7. or 8. ſcrewed to either of the pillars as may be moſt convenient. Otherwiſe the receiver, fig. 20. may be ſupported by the round hoop of braſs, fig. 8. or 7. ſcrewed at a proper height to the pillar, fig. 1. tying round it ſome packthread to defend the glaſs from the contact with the metallic ſupport.

The piece of fig. 6. may be ſcrewed by its collar and ſcrew *e f* to any of the pillars; carrying with it the retort and its receiver, at proper diſtances, higher or nearer to the lamp according as the flame is more or leſs violent.

It eaſily may be conceived, that theſe implements afford all ſorts of conveniences for making any kind of ſmall operations and aſſays in miniature, provided the operator pays a proper attention to the diſpoſition requiſite for each proceſs or operation.

Every glaſs retort, receiver, matraſs, baſon, ſmall funnels, &c. are made by the lamp-workers, that blow beads, thermometers, and other ſmall glaſs inſtruments.

It is directed that the lamp *k*, fig. 3. be filled with ſpirit of wine, becauſe it gives no diſagreeable ſmell, and does not produce any fuliginous and diſagreeable cruſt on the veſſels as oil does: moreover, the ſpirit gives a dry flame, without ſmoke, and ſtronger than oil; beſides the ſpots and diſagreeable conſequences this laſt cauſes, if ſplit, &c. M. de Morveau adds, that the expence of ſpirit is quite inconſiderable; and that he performed in eight or ten minutes, with this apparatus, various diſſolutions, evaporations, and other proceſſes, which otherwiſe would have taken more than three hours, with the expence only of two or three halfpence for the ſpirit of wine, whilſt the fuel of charcoal would have coſt near ten or eleven pence.

But a very important circumſtance is, as Morveau obſerves likewiſe, that many philoſophers do not apply themſelves to chemical operations, for want of opportunity of having a laboratory to perform them: it requiring a proper room, and ſuitable expences of many large furnaces, retorts, crucibles and numerous other implements, &c. whilſt theſe miniature laboratories may in great meaſure afford the ſame advantages; at leaſt to that degree of ſatisfaction ſufficient to aſcertain the contents and products of any ſubſtance that is ſubjected to trial: for with this ſimple apparatus a man of ſome abilities may, without any embaraſſment, in a very ſhort time, and with little expence, perform ſuch diſtillations as require a reverberatory furnace; all ſorts of proceſſes, digeſtions, and evaporations, which require a regular ſand heat; he may vary his experiments or trials, and multiply them to a great number of various performances, draw up his concluſions, and reaſon upon them, without loſs of time, without the hinderance of long preparations to work at large. And even when ſuch large works are to be performed, he may obſerve beforehand various phenomena of ſome ſubſtances, which being known in time, would otherwiſe impede the proceſſes at large, or make them fail abſolutely; and all this without the riſk of a conſiderable loſs, and without expoſing himſelf to a great fire, &c.

PART II. ARRANGEMENT (A) of MINERAL BODIES (B).

THE bodies belonging to the mineral kingdom are divided into four different claſſes, viz.

1. *Earths* (C), or thoſe ſubſtances which are not ductile, are moſtly indiſſoluble in water or oil, and preſerve their conſtitution in a ſtrong heat.
2. *Salts*: theſe diſſolve in water, and give it a taſte; and when the quantity of water required to keep them in diſſolution is evaporated, they concrete again into ſolid and angular bodies.
3. *Inflammables*, which can be diſſolved in oils, but not in water, and are inflammable.
4. *Metals*, the heavieſt of all bodies: ſome of which are malleable, and ſome can be decompounded.

Here, however, it muſt be obſerved, that theſe claſſes are unavoidably blended one with another; and therefore ſome exceptions muſt be allowed in every one of them: for inſtance, in the firſt claſs, the calcareous earth is in ſome meaſure diſſoluble in water, and pipe-clay with ſome others diminiſh ſomewhat in their bulk when kept for a long time in a calcining heat. In the third claſs, the calx of arſenic has nearly the ſame properties as ſalts; and there is no poſſible definition of ſalt that can exclude the arſenic, though at the ſame time it is impoſſible to arrange it elſewhere than among the ſemimetals. In the fourth claſs it is to be obſerved, that the metals and ſemimetals, perfect or imperfect, have not the ſame qualities common to them all; becauſe ſome of them may be calcined, or deprived of their phlogiſton, in the ſame degree of fire in which others are not in the leaſt changed, unleſs particular artifices or proceſſes are made uſe of: ſome of them alſo may be made malleable, while others are by no means to be rendered ſo. That the convex ſurface metals take after being melted, is a quality not particularly belonging to them, becauſe every thing that is perfectly fluid in the fire, and has no attraction to the veſſel in which it is kept, or to any added matter, takes the ſame figure; as we find borax, *ſal fuſile microcoſmicum*, and others do, when melted upon a piece of charcoal: therefore, with regard to all that has

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(A) According to the ſyſtem of *Cronſtedt* †; altered, augmented, and improved from the Obſervations of other Mineralogiſts.

(B) Of the different bodies enumerated in the following claſſification, full explanations are given under their reſpective names as they occur in the courſe of this Work. See alſo METALLURGY, and CHEMISTRY-*Index*.

(C) By *earths*, the author (Mr Cronſtedt) does not mean (ſtrictly ſpeaking) only earths, but includes under that title all the kinds of ſtones or foſſils not inflammable, ſaline, or metallic.

† Cronſtedt's Mineralogy, 2d edition, in 2 vols, by Magellan.

Earths. has been ſaid, it is hardly worth while to invent ſuch definitions as ſhall include ſeveral ſpecies at once; we ought rather to be content with perfectly knowing them ſeparately.

Class I. EARTHS.

Earths, are thoſe mineral bodies, not ductile, for the moſt part not diſſoluble in water or oils, and which preſerve their conſtitution in a ſtrong heat.

Calcareous Earths. Theſe bodies are here arranged according to their conſtituent parts, ſo far as hitherto diſcovered; and are divided into five orders. See the article Earth.

Order I. Calcareous Earths (d).

The properties of theſe are as follow:

1. Friability and falling into a fine white powder after calcination.

2. Partial ſolution in water, with which they contract

(d) Calcareous earth is moſt commonly found in the form of lime-ſtone; hard, compact, and of various colours; under which general name may be comprehended all the different kinds of marbles. Near Bath in England is found a kind of grey ſtone, rather ſoft than hard. This contains calcareous earth in a mild ſtate, and likewiſe ſome in a ſtate of cauſticity: hence, when newly dug out of the earth, it will diſſolve ſulphur, or make lime-water without any calcination. By attraction of fixed air from the atmoſphere, it ſoon hardens after it has been dug up.

Mr Williams [*] divides the lime-ſtones of Scotland into the following ſpecies:

[*] Nat. Hiſt. of the Mineral Kingdom, 2 vols.

1. Grey, whitiſh, and pure white; regularly ſtratified; of a granulated texture; and much uſed in the Highlands for building bridges. Some of it is compoſed of fine glittering ſpangles like the ſcales of fiſhes; and ſome is as pure white as the beſt refined ſugar, which kind he thinks may be called *Parian marble.*

2. Coarſe-looking grey mountain-limeſtone, hard and ſtrong, of a granulated texture, difficult to work, in ſome places rough and unequal, in others ſmooth and even. Sometimes regularly ſtratified, at other times appearing like one vaſt irregular bed or rock, of various thickneſſes.

3. Aſh-coloured mountain-limeſtones, conſiſting of ſmall grains of a fine ſmooth texture; when broken reſembling flint. In the Highlands there are hills of this kind of ſtone, which our author informs us he has ſeen; ſome of which have regular ſtrata, while others appear in one vaſt maſs like a rock of granite.

4. Regularly-ſtratified lime-ſtone, found in the low countries, exhibiting a vaſt variety of colours; as black, blue, grey, brown, purple, red, and aſh-coloured; with various mixtures, of all degrees of hardneſs and purity.

5. Limeſtone accompanying coal, and frequently the immediate roof of the vein. This likewiſe ſhows a great variety of colour, texture, and quality; ſome being ſo much adulterated with clay and other heterogeneous mixtures as to be good for nothing, while others are very pure and fine. Theſe limeſtones are always found in regular ſtrata. "They are found (ſays our author) as regular as the coals they accompany; and the coal-ſtrata are more regular in continuation upon the bearing, as far as the claſs of ſtrata belonging to the coal reaches, than any other that I have inveſtigated; and I look upon it, that this obſervation may be of uſe in practice."

For diſcovering limeſtone at ſome diſtance, Mr Williams gives the following directions:—Let them keep the line of ſtretch, or bearing of the ſtrata; and, in the coal-country, they will be ſure to diſcover it at nearly the ſame parallel diſtance from a ſeam of coal or other given ſtratum, as the place where it was laſt ſeen. But many of the mountain-limeſtones are not much to be depended on. Though you may have a good and plentiful quarry in one place, yet, perhaps, half a mile, or half a quarter of a mile farther forward, you cannot diſcover it: it is dwindled away to nothing, and yet will appear again farther forward; which makes the mountain-limeſtones uncertain to be diſcovered where you do not ſee them; as theſe rocks very frequently grow thicker or thinner, and ſometimes ſqueezes out to nothing: and I comprehend under this denomination all the limeſtones not accompanying the coals and coal-metals.—The limeſtones of the coal fields are often diſtinguiſhable by containing a great variety of ſhells, coral, and other marine bodies, which are found blended in the heart and compoſition of the ſtone."

6. The Scotch marbles are of great variety and beauty; and the parts of the kingdom moſt unfit for cultivation are found to abound moſt in them. Aſſint in Sutherland has a kind of white ſtatuary marble, which Mr Williams ſays is the pureſt and beſt he ever ſaw. "I am perſuaded (ſays he) there is none better, if any ſo good, in all Europe, and there is enough of it to ſerve all Britain; perfectly ſolid and pure, free of any blemiſhes, flaws, or ſtains, and blocks or ſlabs of any ſize may be cut out: but there is bad acceſs to it; nor would it be eaſily quarried, there being a little cover above it, of a ſoft, looſe, whitiſh limeſtone. This marble accompanies a prodigious rock of grey limeſtone, of a granulated texture, appearing in regular ſtrata at Aſſint; but it is one of thoſe which varies in thickneſs as you advance along the bearing of the ſtrata. The good white marble of Aſſint is only to be ſeen in the bed of the river, near a conſiderable houſe a mile or two ſouth of the church; but I cannot remember the name of the particular place."

Near Blairgourie in Perthſhire, not far from the ſide of the high road, is an excellent, granulated, broad-bedded limeſtone, of a ſugar-loaf texture, and as white as the fineſt ſtatuary marble, which Mr Williams ſuppoſes to be a good ſpecies of the true Parian marble, and that it requires only to be known and brought into uſe to become of great value. In the duke of Gordon's lands, in the foreſt of Glenavon, there is alſo a kind of marble compoſed of broad glittering grains like ſpangles, as large as the ſcales of fiſhes; but the ſituation is remote, and difficult of acceſs.

tract great heat, and by ſprinkling with water they fall more readily into powder.

3. Infuſibility without addition.

4. They attract the fixed air from the vegetable and mineral alkalies, and thus rendering them much more cauſtic, becoming at the ſame time mild themſelves.

5. Solubility in all acids except the vitriolic, tartarous, and ſome anamalous vegetable acids.

6. Fuſibility with borax and microcoſmic ſalts.—The fuſion is attended with effervescence, and the reſult is a tranſparent and colourleſs glaſs.

7. With metalline calces they melt into a corroſive ſlag.

8. They imperfectly reduce the calces of lead and biſmuth, and have even ſome effect upon thoſe of copper and iron.

The calcareous earth is found,

I. Pure.
  1. In form of powder. *Agaricus mineralis*, or *lac lunæ*.
    a. White, in moors, and at the bottom of lakes.
    b. Red.
    c. Yellow.
  2. Friable and compact. Chalk, *creta*.
    a. White, *creta alba*. Chalk is a name alſo applied to other earths; whence we hear of chalks of various colours: but there are none which are known to be of a calcareous nature, except this kind here deſcribed, and of which there are no other varieties, otherwiſe than in regard to the looſeneſs of the texture, or the fineneſs of the particles.
  3. Indurated, or hard; Limeſtone; *Lapis calcareus*.
    A. Solid, or not granulated.
      a. White.
      b. Whitiſh yellow.
      c. Fleſh-coloured, found in looſe maſſes.
      d. Reddiſh brown.
      e. Grey.
      f. Variegated with many colours, and particularly called *marble*.
      g. Black.
    B. Grained or granulated limeſtone.
      1. Coarſe-grained, and of a looſe texture, called *ſalt-ſlag* in Swediſh, from its reſemblance to lumps of ſalt.
        a. Reddiſh yellow. *b.* White.
      2. Fine grained.
        a. White *b.* Semi-tranſparent, from Solfatara in Italy, in which native brimſtone is found.
      3. Very fine grained.
        a. White and green. *b.* White and black.
    C. Scaly limeſtone.
      1. With coarſe or large ſcales.
        a. White. *b.* Reddiſh yellow.
      2. With ſmall ſcales.
        a. White.
      3. Fine glittering or ſparkling.
        a. White. *b.* Of many colours.
    D. Lime or calcareous ſpars.
      (1.) Of a rhomboidal figure.
        A. Tranſparent or diaphanous.
          1. Refracting ſpar; *Spatum iſlandicum;* Iceland ſpar, or Iceland cryſtal.—This repreſents the objects ſeen through it double.
          2. Common ſpar, which ſhows the object ſingle.
            a. White, or colourleſs.
            b. Yellowiſh and phoſphoreſcent.
        B. Opaque.
          1. White. 2. Black. 3. Browniſh yellow.
      (2.) Foliated or plated ſpar.
        a. Opaque white.
    E. Cryſtallized calcareous ſpars. *Spar. Druſen* (E).
      (1.) Tranſparent.
        a. Hexagonal truncated.
        b. Pyramidal.
          1. Dog's teeth; *Pyramidales diſtinctæ*.
          2. Balls of cryſtallized ſpar, *Pyramidales concretæ*.
    F. Stalactitical ſpar; *Stalactites calcareus*. Stalactites, Stone-icicle, or Drop-ſtone.
      (1.) Scaled ſtalactites of very fine particles.
        a. Of a globular form.
          1. White, the pea-ſtone.
          2. Grey, *piſolithus, oolithus*. Alſo the hammites, from its reſemblance to the roes or ſpawn of fiſh. It has been exhibited by authors as petrified roes. The Ketton free-ſtone, of Rutlandſhire, is a remarkable ſtone of this ſort.
        b. Hollow, in the form of a cone.
          1. White.
        c. Of an indeterminate figure.
        d. Of coherent hollow cones.
      (2.) Solid ſtalactites of a ſparry texture.
        a. Hollow, and in form of a cone.
          1. White, and ſemitranſparent.

II. Sa-

In Lochaber, near the farm houſes on the north ſide of the ferry of Ballachyliſh, is a limeſtone or marble rock, of a beautiful aſhen-grey colour, and a fine regular uniform grain or texture; capable of being raiſed in blocks or ſlabs of any ſize, and of receiving a fine poliſh. It is beautifully ſprinkled with fine bright grains of mundick or pyrites, and likewiſe with grains or ſpecks of beautiful lead ore of a fine texture.

About three miles ſouth of Fort-William, in the bed of a river, is a curious kind of marble with a black ground, flowered with white, like fine needle-work, or rather reſembling the froſt-flowering upon glaſs windows in winter; and this flowering is not only on the outſide, but quite through all parts of the body of the ſtone.

Scotland has alſo chalk in abundance; ſome of which is regularly ſtratified, and much appears in thick irregular maſſes like ſediment.

(E) The tranſlator of Mr Cronſtedt's Treatiſe has adopted this German term *druſen* into the Engliſh language, for a cluſter of regular figured bodies, as a groupe conveys the idea of a cluſter only, whether regular or of indeterminate figures.

II. Saturated or combined with the acid of vitriol. Gypſum, Plaſter-ſtone, or Parget.

1. Looſer and more friable than a pure calcareous earth.

2. Either crude or burnt, it does not excite any effervescence with acids; or, at moſt, it effervefces but in a very ſlight degree, and then only in proportion as it wants ſome of the vitriolic acid to complete the ſaturation.

3. It readily falls into a powder in the fire.

4. If burnt, without being red hot, its powder readily concretes with water into a maſs, which ſoon hardens; and then,

5. No heat is perceived in the operation.

6. It is nearly as difficult to be melted by itſelf as the limeſtone, and ſhows moſtly the ſame effects with other bodies as the lime-ſtone: the acid of vitriol ſeems, however, to promote its vitrification.

7. When melted in the fire with borax, it puffs and bubbles very much, and for a long while, during the fuſion, owing to the nature of both the ſalts.

8. When a ſmall quantity of any gypſum is melted together with borax, the glaſs becomes colourleſs and tranſparent; but ſome ſorts of alabaſter and ſparry gypſa, when melted in ſome quantity with borax, yield a fine tranſparent yellow coloured glaſs, reſembling that of the beſt topazes. This phenomenon might probably happen with every one of the gypſeous kind. But it is to be obſerved, that if too much of ſuch gypſum is uſed in proportion to the borax, the glaſs becomes opaque, juſt as it happens with the pure limeſtone.

9. Burnt with any inflammable matter, it emits a ſulphureous ſmell; and may as well by that means, as by both the alkaline ſalts, be decompounded; but for this purpoſe there ought to be five or ſix times as much weight of ſalt as of gypſum.

10. Being thus decompounded, the calx or earth which is left ſhows commonly ſome marks of iron.

The gypſeous earth is found,

(1.) Looſe and friable. Gypſeous earth, properly ſo called; *Guhr.*

A. White.

(2.) Indurated.

A. Solid, or of no viſible particles, Alabaſter.

a. White, alabaſter.

1. Clear and tranſparent.

2. Opaque,

b. Yellow.

1. Tranſparent, from the Eaſtern countries.

2. Opaque.

B. Gypſum of a ſcalded or granulated ſtructure. This is the common plaſter-ſtone.

1. With coarſe ſcales. *a.* White.

2. With ſmall ſcales. *a.* Yellowiſh. *b.* Greyiſh.

C. Fibrous gypſum, or plaſter-ſtone, improperly (though commonly) called *Engliſh talc* by the druggiſts.

1. With the fibres coarſe. *a.* White, from Livonia.

2. With fine fibres. *a.* White.

D. Spar-like gypſum. Selenites, by ſome alſo called *glacies mariæ*; and confounded with the clear and tranſparent mica.

1. Pure ſelenites.

A. Tranſparent.

a. Colourleſs. *b.* Yellowiſh.

2. Liverſtone, ſo called by the Swedes and Germans.

E. Cryſtallized gypſum. Gypſeous druſen.

(1). Druſen of chryſtals of pure ſparry gypſum.

A. Wedge-formed, compoſed of a pure ſpar-like gypſum.

a. Clear and colourleſs. *b.* Whitiſh yellow.

B. Capillary.

a. Opaque whitiſh yellow. *b.* Hexagonal, priſmatic. *c.* Globular, conſiſting of cuneated rays proceeding from the centre.

F. Stalactitical gypſum. *Gypſum ſinter.*

1. Of no viſible particles; in French, *grignard.*

A. Of an irregular figure.

a. Yellow. *b.* White.

2. Of a ſpar-like texture.

A. In form of a cone.

a. White and yellow.

B. Of an irregular figure.

a. White.

III. Calcareous earth ſaturated with the acid of common ſalt. *Sal ammoniacum fixum naturale.*

This is found, 1. In ſea-water. 2. In ſalt-pits.

IV. Calcareous earth combined or ſaturated with ſparry acid, known by the name of *ſparry fluor* and *blue john.*

Theſe are commonly called *fluxing*, *vitreſcent*, or *glaſs-ſpars*; becauſe moſt part of them have a ſparry form and appearance: they are, however, often met in an indeterminate figure.

They are only known in an indurated ſtate, and diſtinguiſh themſelves from the other earths by the following characters.

1. They are ſcarce harder than common calcareous ſpars, and conſequently do not ſtrike fire with ſteel.

2. They do not ferment with acids neither before nor after calcination.

3. They do not melt by themſelves, but crack and ſplit to pieces when expoſed to a ſtrong fire. But,

4. In mixtures with all other earths they are (generally) very fuſible, and eſpecially with calcareous earth, with which they melt into a corroding glaſs that diſſolves the ſtrongeſt crucibles, unleſs ſome quartz or apyrous clay be added thereto.

5. When heated ſlowly, and by degrees, they give a phoſphoreſcent light: but as ſoon as they are made red-hot, they looſe this quality. The coloured ones, eſpecially the green, give the ſtrongeſt light, but none of them any longer than whilſt they are well warm.

6. They melt and diſſolve very eaſily by the addition of borax, and, next to that, by the microcoſmic ſalt, without ebullition.

A. Indurated fluor.

(1.)

Calcareous Earths.

(1.) Solid, of an indeterminate figure; of a dull texture, ſemitranſparent, and full of cracks in the rock.

a. White.

(2.) Sparry fluor. This has nearly the figure of ſpar; though on cloſe obſervation it is found not to be ſo regular, nothing but the gloſſy ſurfaces of this ſtone giving it the reſemblance of ſpar.

a. White *b.* Blue. *c.* Violet. *d.* Deep green. *e.* Pale green. *f.* Yellow.

(3.) Cryſtalliſed fluor.

1. Of an irregular figure. *a.* White. *b.* Blue. *c.* Red.

2. Of a cubical figure. *a.* Yellow. *b.* Violet.

4. Of a polygonal ſpherical figure. *a.* White. *b.* Blue.

4 Of an octoedral figure. *a.* Clear, colourleſs.

V. Calcareous earth ſaturated with a particular acid, perhaps of the metallic kind, *viz.* the tungſtenic acid. The *tung ſtein* of the Swedes.

This reſembles the garnet-ſtone and the tin-grains; is nearly as heavy as pure tin; very refractory in the air, and exceſſively difficult to reduce to metal. Iron has, however, been melted out of it to more than 30 *per cent.* It is very difficultly diſſolved by borax and alkaline ſalts, but melts very eaſily with the microcoſmic ſalt, giving a black ſlag; and for this reaſon the laſt mentioned ſalt muſt be employed in the aſſays of this ſtone. It is found,

1. Solid and fine-grained.

a. Reddiſh or fleſh-coloured. *b.* Yellow.

2. Spathoſe, and with an unctuous ſurface.

a. White. *b.* Pearl-coloured.

VI. Calcareous earth united with the inflammable ſubſtance.

Theſe have a very offenſive ſmell, at leaſt when rubbed. They receive their colour from the phlogiſton, being dark or black in proportion as it predominates.

(1.) Calcareous earth mixed with phlogiſton alone; *Lapis ſuillus*, fetid ſtone and ſpar, or ſwine-ſtone and ſpar.

A. Solid, or of no viſible or diſtinct particles.

a. Black.

B. Grained.

a. Blackiſh brown.

C. Scaly, *particulis micaceis.*

1. With coarſe ſcales. *a.* Black.

2. With fine ſparkling ſcales. *a.* Brown.

D. Sparry.

a. Black. *b.* Light brown. *c.* Whitiſh yellow.

E. Cryſtalliſed.

1. In a globular form.

VII. Calcareous earths blended with an argillaceous earth. Marle, *Marga.*

1. When crude, it makes an effervеſcence with acids: but,

2. Not after having been burnt; by which operation it is obſerved to harden, in proportion as the clay exceeds the calcareous ſubſtance.

3. It eaſily melts by itſelf into a glaſs, and even when it is mixed with the moſt refractory clay.

4. It is of great uſe in promoting the growth of vegetables, ſince the clay tempers the drying quality of the calcareous earth.

5. When burnt in a calcining heat, it readily attracts water: and, expoſed to the air, in time it falls into a powder.

Calcareous Earths.

The varieties of this kind worthy to be taken notice of, depend on the different quantities of each of their component parts, and on the quality of the clay. The following are ſpecified as examples.

A. Looſe and compact, *Marga frialilis.*

a. Reddiſh brown.

b. Pale red. This, when burnt, is of a yellowiſh colour, and uſed for making earthen ware in ſome places.

B. Semi-indurated; which is nearly as hard as ſtone when firſt dug up, but moulders in the open air.

a. Grey. *b.* Red.

C. Indurated or ſtone marle.

A. in looſe pieces, *Marga indurata amorpha*; by the Germans called *duckſtein* or *tophſtein*.

a. White. *b.* Grey, formed from a ſediment which the water carries along with it.

B. In continued ſtrata. Hard ſlaty marle.

VIII. Calcareous earth united with a metallic calx.

Here, as well as in the others, ſuch a mixture or combination is to be underſtood, as cannot be diſcovered by the eye alone without the help of ſome other means.

The ſubjects belonging to this diviſion loſe the property of raiſing an effervеſcence with acids, when they are rich in metal, or contain any vitriolic acid. However, there have been found ſome that contained 20 or 30 *per cent.* of metal, and yet have ſhown their calcareous nature by the nitrous acid.

There are no more than three metals hitherto known to be united in this manner with the calcareous earth, *viz.*

(1) With iron. White ſpar like iron ore, *Minera ferri alba.* The *ſtahlſtein* or *weiſes eiſenerz* of the Germans.

1. This ore, however, is not always white, but commonly gives a white powder when rubbed.

2. It becomes black in the open air, as likewiſe in a calcining heat.

3. In this laſt circumſtance it loſes 30 or 40 *per cent.* of its weight, which by diſtillation has been found owing to the water that evaporates; and it is poſſible that ſome ſmall quantity of vitriolic acid may, at the ſame time, evaporate with the water.

4. It is of all the iron ores the moſt eaſy to melt, and is very corroſive when melted.

This kind is found,

A. Looſe; the mouldered part of the indurated ſort.

a. Black, like ſoot.

b. Dark brown, ſomewhat reſembling umbre.

B. Indurated.

1. Solid, of no diſtinct particles.

a. Red. Looks like red ochre, or the red hæmatites, but diſſolves in the acid of nitre with a great effervеſcence.

2. Scaly, *particulis micaceis.*

a. White.

b. Blackiſh grey.

3. Spar-like.

a. Light brown.

4. Druſen.
  a. Blackiſh brown.
  b. White.
    1. Porous. This is often called *eiſenblute*, or *flos ferri*.
    2. Cellular.

(2) With copper.
  A. Looſe and friable. Mountain blue; Germanice, *Bergblau*. This diſſolves in aquafortis with effervefcence.
  B. Indurated.
    1. Pure calcareous earth mixed with calx of copper. Armenian ſtone, *lapis Armenus*.
    2. Gypſeous earth united with calx of copper. Is of a green colour; and might perhaps be called *turquoiſe ore*, or *malachites*; though we do not know if all ſorts of turquoiſe ore are of this nature.
      a. Semi-tranſparent, is found at Ardal in Norway.

(3.) With the calx of lead.

This is a lead ochre, or a ſpar-like lead-ore, which, in its formation, has been mixed with a calcareous earth, and for that reaſon effervefces with acids.
  A. Looſe and friable.
    1. White.
  B. Indurated.
    1. Scaly.
      a. Yellowiſh.

Both theſe varieties contain a conſiderable quantity of lead, *viz.* 40 *per cent.* more or leſs; and the calcareous earth, is as equally and intimately mixed with it, as in the white iron ore.

IX. The following compounds of calcareous earth with different mineral ſubſtances are added from Mr Kirwan's Elements of Mineralogy.

1. A compound of calcareous and barotical earths: of this ſpecies are ſome yellowiſh ſtones found in Derbyſhire, conſiſting of lumps of limeſtone interſperſed with nodules of baroſelenite. Many more may occur as compounds of gypſum and baroſelenite, fluor and baroſelenite, &c. &c.
2. Compounds of calcareous and magneſian earths; ſuch as,
  a. The white marble, interſperſed with ſpots of ſteatites of ſoap-rock, either green or black, called by Crondſtedt *kolmord marble*. This marble is of a ſcaly texture.
  b. The *pietra talchina* of the Italians, which conſiſts of white ſpar with veins of talc.
  c. The *verde antico* of the Italians, which is a light green marble, with deep green, black, white, and purple ſpots. According to Mr Bayen, it contains 62 parts of mild calcareous earth, 30 of green talc, 1 of magneſia, and 1 of ſemiphlogiſticated iron.
3. Compounds of calcareous and argillaceous earths; ſuch as,
  a. The green Campan marble from the Pyrenées. It is ſlaty and ſomewhat magnetic. According to Mr Bayen, it contains 65 of mild calcareous earth, 32 of the argillaceous, and 3 of ſemiphlogiſticated iron.
  b. The red Campan marble: this is not magnetic; it contains 82 parts of mild calcareous earth, 11 of argillaceous ſhiſtus, and 7 of dephlogiſticated iron.
  c. Yellow figured marble from Florence: according to Mr Bayen, it contains 75 parts of mild calcareous earth, 13 or 14 of ſhiſtus, and 4 or 5 of dephlogiſticated iron.
  d. Griotte marble from Autun of Burgundy in France: it contains 67 parts of mild calcareous earth, 26 of reddiſh ſchiſtus, 2 of iron, and 1 of magneſian earth.
  e. The Amandola, which is a green marble, honey-comb like, with white ſpots. It contains 76 parts of mild calcareous earth, 20 of ſchiſtus, and 2 of ſemiphlogiſticated iron. The cellular appearance proceeds from the ſchiſtus.
4. Compounds of calcareous earth and mica; ſuch as,
  a. The cipolin from Autun in France: it is of a green colour, and conſiſts of 83 parts of chalk, 12 of green mica, and 1 of iron.
  b. The micaceous limeſtone, is of a glittering appearance, of various degrees of hardneſs, and effervefces with acids. Such as the macigno of the Italians; their yellow pietra bigia; and their blue pietra columbina or turkina.
5. Compounds of calcareous and ſiliceous earths; ſuch as,
  a. The calcareous quartz and pudding-ſtone: this conſiſts of lumps of quartz, and ſometimes of felt-ſpar in a calcareous cement.
  b. The limeſtone with veins of quartz; ſuch as the *ſaxum ſahlbergenſe*, and ſeveral marbles of Sweden and Siberia, which ſtrike fire with ſteel.
6. Calcareous volcanic pudding-ſtone; ſuch as,
  a. The cierchina, which conſiſts of lumps of ſpar and lava, in a calcareous cement, mentioned by Mr Ferber.
  b. The marble mixed with veins of black or green lava, mentioned by the ſame author.
7. Compounds of calcareous earth, mixed with two or more kinds of earth; ſuch as,
  a. The cipolin from Rome, which is a green marble with white zones: it ſtrikes, though difficultly, fire with ſteel: it contains 67,8 parts of mild chalk, 25 of quartz, 8 of ſhiſtus, and 0,2 of iron, beſides the iron contained in the argillaceous ſhiſtus.
  b. The calcareous porphyry, which conſiſts of quartz, felt-ſpar, and mica in ſeparate grains united by a calcareous cement.
  c. The limeſtone interſperſed with ſhoerl and mica.
  d. To theſe compounds belongs the pyritaceous limeſtone called by the French *Pierre de St Ambroix*. It is of an iron grey colour, interſperſed with ſhining particles. Its texture is compact, and ſcarcely gives fire with ſteel. Its ſpecific gravity is 2,7034 It is ſoluble in acids, and moſtly with effervefcence; calcines in a ſtrong fire; makes nitre ſlightly detonate; and if diſtilled affords a ſmall portion of vitriolic acid, and ſome ſulphur ſublimes. Its com-

ponent

Ponderous Earth.

ponent parts are 75 of mild calcareous earth and 25 of pyrites; in which are contained 14 of argill, 7 of quartz and ſulphur, and 4 of iron.

Order II. PONDEROUS EARTH.

PONDEROUS earth, *(Terra Ponderoſa)*: Cauk, or calk. See EARTH, Art. I. This is a particular kind of earth (like chalk in appearance, but with ſome very different properties), diſcovered in Sweden about 1774, which by its reſults with other bodies has ſome ſimilarity to the known alkalis. It has not yet been found pure, but mixed with other ſubſtances: however, its great ſpecific weight eaſily diſtinguiſhes it from the others, it being the heavieſt of all earths.

1. Its ſpecific gravity when conſiderably purified by art is 3,773.
2. This earth combines with aerial acid: and in this caſe efferveſces with ſtronger acids.
3. With vitriolic acid it forms the ponderous ſpar, which is inſoluble in water.
4. Its cryſtallization, after being combined with the nitrous, or with the muriatic acids, is hardly ſoluble;
5. But with acetous acid, it becomes deliqueſcent.
6. When pure; viz. without any mixture of acid or alkali, it does not vitrify in the fire.
7. If deprived of the aerial acid (fixed air) by calcination, is then ſoluble in 900 times its weight of boiling water. This ſolution expoſed to air, forms a cremor, like that of lime-water in the ſame circumſtances, and like it changes alſo the vegetable colours.
8. Whilſt combined with aerial acid, it is only ſoluble in about 1550 times its weight of water, chiefly if the water has been impregnated alſo with the ſame aerial acid.
9. It expels the cauſtic volatile alkali from ammoniacal ſalt.
10. Mixed with brimſtone it produces a hepar ſulphuris, whoſe ſolution in water is but incompletely decompoſed either by the nitrous or the muriatic acid, on account of the great attraction between this earth and the acid of ſulphur, which is ſo ſtrong that it
11. Separates this acid (the vitriolic) from the vegetable alkali.

I. Combined with aerial acid; *Terra Ponderoſa aërata*. See CHEMISTRY-*Index*.

It reſembles alum, but is hard and ſtriated, as if compoſed of radiating fibres coming from a centre. It is found in Allſton-moor in England.

A. Spar-like gypſum.

1. Semitranſparent, *ſpatum Bononienſe*. The Bononian ſtone, or native phoſphorus.
2. Opaque. *a.* White. *b.* Reddiſh.

B. Ponderous Druſen ſpar.

1. Jagged, *criſtatum*. Theſe reſemble cock's combs, and are found in clefts and fiſſures accreted on the ſurfaces of balls of the ſame ſubſtance.
2. White.
3. Reddiſh.

II. United with phlogiſton and the vitriolic acid. *Leberſtein* of the Germans and Swedes. *Lapis hepaticus*.

Magneſian Earths.

This ſtone in ſome ſpecimens conſtantly, but in others only when rubbed, ſmells like the *hepar ſulphuris*, or gun-powder.

It is found.

A. Scaly.

1. With coarſe ſcales. *a.* Whitiſh yellow.
2. With fine ſparkling ſcales. *a.* Black.

Order III. MAGNESIAN, MICACEOUS, and ASBESTINE EARTHS.

§ 1. *Magneſian Earths.*

MAGNESIA is a white, looſe, and light earth, only known ſince the beginning of this century. It is generally found combined or mixed with other heterogeneous ſubſtances, as other ſimple earths are.

1. When pure its ſpecific gravity is 2,330, and then,
2. It neither hardens, contracts, nor melts by the application of heat, even by the ſolar rays.
3. But it melts eaſily with borax, or microcoſmic ſalt; though it is ſcarcely affected by fixed alkalis or calces of lead.
4. Mixed with other earths, it produces by fire different hard maſſes.
5. It gives no cauſticity except to the volatile alkali: and,
6. Does not efferveſce with any acid.
7. When mixed with water it ſhows a very ſmall degree of heat, but without any efferveſcence. And when the water exceeds the weight of magneſia about 7,692 times, it is totally diſſolved.

8 and 9. Being put in water and afterwards dried, it contains $\frac{18}{100}$ parts of its weight; though when ſaturated with aerial acid, it will abſorb and retain after being dried $\frac{66}{100}$ parts of water.

10. This earth combined with aerial acid is more ſoluble in cold than in hot water.
11. Combined with vitriolic acid it cryſtallizes into a bitter ſalt, known by the name of *Epſom* and *Seydlitz* or *Scidſchulitz* ſalt, which is ſoluble in little more than its own weight of water.
12. With nitrous acid it forms a deliqueſcent ſalt.
13. With the muriatic or the acetous acids it does not cryſtallize: and the maſs being dried, attracts humidity from the air.
14. It has a ſtronger attraction to the fluor acid than to any other (Berg.): and cryſtallizes with it into hexangular priſms whoſe ends are formed of two low pyramids, of three rhombs *(Romé de l'Iſle)*.
15. It is not precipitated from other acids by the vitriolic, as calcareous earth is.
16. According to Lavoiſier and Macquer, when magneſia is calcined, it becomes phoſphoreſcent.

I. Magneſia combined with vitriolic and other acids.

A. When ſaturated with the vitriolic acid, it forms a bitter ſalt, called *Engliſh* or *Epſom*, *Seydlitz* or *Sedlitz* ſalt. The ſalts known under theſe dif-

Magnesian Earths.

ferent names only differ from one another on account of ſome heterogeneous ſubſtance, which is combined in them, the vitriolated magneſia being the characteriſtic and principal ingredient in them all.

B. Magneſia is found not only combined with the vitriolic acid in the waters of Epſom, Sedlitz, &c. but alſo with the marine acid to a conſiderable quantity in ſea-water and other ſalt ſprings.

C. It is contained frequently in freſh waters, where it is diſſolved by means of a quantity of aerial acid.

II. Combined with other earths.

A. Magneſia, when combined with ſiliceous earth, is commonly unctuous to the touch, and more or leſs difficult to be cut or turned in proportion to its different degrees of hardneſs.

It is not diffuſible in water: grows hard, and is very refractory in the fire.

When pounded and mixed with water, it will not eaſily cohere into a paſte: however, if it is managed with care, it may be baked in the fire to a maſs, which being broken, ſhows a dull and porous texture.

It takes for the moſt part, and without much labour, a fine poliſh. It is found,

(1.) Compact and ſoft; *Smectis*, *Briançon* or French Chalk.
- *a.* White, from the Lands-End, in Cornwall.
- *b.* Yellow.
- *c.* Red and white, from the Lands-End: the ſoap-earth, from Switzerland: it looks like Caſtile-ſoap.

(2.) Solid and compact; of impalpable particles: Steatites or ſoap-rock.
- *a.* White, or light green. *b.* Deep green.—*c.* Yellow.

(3.) Solid, and of viſible particles; ſerpentine ſtone.

A. Of fibrous and coherent particles.

This is compoſed, as it were, of fibres, and might therefore be confounded with the aſbeſtus, if its fibres did not cohere ſo cloſely with one another, as not to be ſeen when the ſtone is cut and poliſhed. The fibres themſelves are large, and ſeem as if they were twiſted.
- *a.* Deep green. It is ſold for the *lapis nephriticus*, and is dug at ſome unknown place in Germany. *b.* Light green, from Skienſhyttan, in Weſtmanland; is uſed by the plate-ſmiths inſtead of French chalk.

B. Of granulated particles; fine grained ſerpentine ſtone, the Zoeblitz ſerpentine.
- *a.* Black. *b.* Deep green. *c.* Light green. *d.* Red. *e.* Bluiſh grey. *f.* White. Theſe colours are all mixed together in the ſerpentine ſtone from Zoeblitz, but the green is the moſt predominant colour.

B. Porcelain earth mixed with iron; *terra porcellanea.* This is,

A. Diffuſible in water.
- *a.* Red, from Montmartre, and China. The water-clinkers which are imported from certain places in Germany ſeem to be made of this kind.

B. Indurated.

Magnesian Earths.

1. Martial ſoap earth.
   - *a.* Red.
2. Martial ſoap-rock.
   - *a.* Black.
   - *b.* Red.

C. The telgſten of the Swedes; *lapis ollaris.*
- *a.* Light grey. *b.* Whitiſh yellow. *c.* Dark grey. *d.* Dark green.

The ſerpentine ſtone has many varieties; being found, (1.) Veined or ſpotted with green ſteatites. (2.) Red, with veins of aſbeſtos. (3.) Red, green, yellow, or black with veins or ſpots of white calcareous ſpar, is called *polzevera.* The black is called *nero di prato*; the green *verde di Suza*; but theſe names are not reſtrained to this ſpecies. (4.) Veined or ſpotted with gypſum. (5.) Veined or ſpotted with baroſelenite. (6.) Veined or ſpotted with ſhiſtus.—And, (7.) With veins of quartz, feltſpar, or ſhoerl. (*Kirwan's Mineralogy.*)

What is commonly called *ſerpentine* is a true *lapis ollaris*; but being variegated with green, yellowiſh, and brown ſpots, like the ſkin of ſome common ſerpents, it is called by that name. Great quantities of this ſtone are found in Italy and Switzerland, where it is often worked into the ſhape of diſhes and other vaſes. (*Fabroni.*) And the *gabro* of the Italians is nothing elſe but a kind of ſerpentine. (*Kirwan.*)

§ 2. *Micaceous Earths.*

Theſe are known by the following characters:

1. Their texture and compoſition conſiſt of thin flexible particles, diviſible into plates or leaves, having a ſhining ſurface.
2. Theſe leaves or ſcales expoſed to the fire loſe their flexibility and become brittle, and then ſeparate into inner leaves: but in a quick and ſtrong fire, they curl or crumple, which is a ſtep towards fuſion; though it is very difficult to reduce them into pure glaſs by themſelves or without addition.
3. They melt pretty eaſily with borax, the microcoſmic ſalt, and the alkaline ſalt: and may by means of the blow-pipe be brought to a clear glaſs with the two former ſalts. The martial mica is, however, more fuſible than the uncoloured ones: its ſpecific gravity is 3,000.

A. Colourleſs or pure mica; daze, glimmer, or gliſt.
1. Of large parallel plates; Muſcovy glaſs. This is tranſparent as glaſs; found in Siberia and Elfdalen in the province of Wermeland.
2. Of ſmall plates, from Silfverberget, and Runneby, in the province of Blekinge.
3. Of fine particles like chaff; chaffy mica.
4. Of twiſted plates; crumpled mica.

B. Coloured and martial glimmer.
1. Brown, ſemi-tranſparent.
2. Of fine and minute ſcales.
   - *a.* Brown. *b.* Deep green. *c.* Light green. *d.* Black.
3. Twiſted or crumpled glimmer.
   - *a.* Light green.
4. Chaffy glimmer.
   - *a.* Black.

5. Chry-

Magneſian Earths.

5. Chryſtalliſed glimmer.
  a. Of concentrated and erect ſcales.
  b. Of hexagonal horizontal plates.

The tranſparent Muſcovy glaſs is uſed for windows, and upon all occaſions where panes of glaſs are wanted. Perhaps it might alſo be advantageouſly employed to cover houſes.

The twiſted or crumpled mica, which is found at Hardol in Jemtland, is there manufactured into kettles and other veſſels, as alſo for hearths of chimnies: and the powder which falls in the working may be mixed with the common ſalt for the diſtillation of the muriatic acid.

§ 3. *Aſbeſtine Earths.*

Theſe are only yet diſcovered in an indurated ſtate; and their characters are as follows:

1. When pure, they are very refractory in the fire.
2. In large pieces they are flexible.
3. They have dull or uneven ſurfaces.
4. In the fire they become more brittle.
5. They do not ſtrike fire with the ſteel.
6. They are not attacked by acids.
7. They are eaſily brought into fuſion by borax or alkali.

In this ſection are included both thoſe varieties which by foſſilogiſts have been mentioned under the names of *amiantus* and *aſbeſtus*, and have often been confounded together.

I. Aſbeſtus, which is compounded of ſoft and thin membranes; *amiantus Wallerii.*
  A. Of parallel membranes: *Corium, ſive caro montana*, Mountain-leather.
    1. Pure. *a.* White.
    2. Martial. *a.* Yellowiſh brown.
  B. Of twiſted ſoft membranes; mountain-cork.
    1. Pure. *a.* White.
    2. Martial. *a.* Yellowiſh brown.

II. Of fine and flexible fibres; or earth flax: *aſbeſtus Wallerii.*
  A. With parallel fibres: *Byſſus.*
    1. Pure and ſoft. *a.* Light green. *b.* White.
    2. A little martial, and more brittle.
      a. Greeniſh, from Baſtnas Grufva, at Ryddarhyttan in Weſtmanland. There it forms the greateſt part of the vein out of which the copper ore is dug; a great part of it is conſequently melted together with the ore, and is then brought to a pure ſemi-tranſparent martial ſlag or glaſs.
  B. Of broken and recombined fibres.
    1. Martial. *a.* Light green.

Order IV. Siliceous Earths.

Siliceous earth is, of all others, the moſt difficult to deſcribe and to diſtinguiſh perfectly; however, it may be known by the following characters, which are common to all bodies belonging to this order.

1. In its indurated ſtate it is hard, if not in regard to the whole, yet at leaſt in regard to each particle of it, in a degree ſufficient to ſtrike fire with ſteel, and to ſcratch it, when rubbed againſt it, though the ſteel be ever ſo well tempered.
2. When pure, and free from heterogeneous particles, it does not melt by itſelf, neither in a reverberatory nor in a blaſt furnace.

Siliceous Earths. Gems.

3. After being burnt, it does not fall to a powder, neither in the open air nor in water, as the calcareous earth does, but becomes only a little looſer and more cracked by the fire, unleſs it has been very ſlowly, and by degrees, heated.
4. It excites no efferveſcence with acids.
5. In the fire it melts eaſieſt of all to a glaſs with the fixed alkaline ſalt; and hence it has got the name of vitreſcent, though this name is, properly ſpeaking, leſs applicable to this order than to a great many other earths.

To the above we may add the following properties from Bergman.

6. It is not ſoluble in any of the known acids, the fluor-acid only excepted. But,
7. It may be diſſolved by the fixed alkali, both in the dry and wet way.
8. If the fixed alkali is only half the weight of the ſiliceous earth, it produces a diaphonous and hard glaſs: but when it is in a double or triple proportion, then the glaſs deliqueſces of itſelf by attracting the humidity of the atmoſphere..
9. It melts eaſily with borax; but
10. With microcoſmic ſalt it is more difficult, and requires a longer time to melt.
11. This earth has a great analogy to acids, as it is perfectly diſſolved in that wonderful natural hot-water ſpout above ninety feet high at Geyſer, in Iceland, where by cooling it forms a ſiliceous maſs.

§ 1. *Gems, or precious ſtones.*

I. Diamond. *Adamas gemma.* See Diamond.
  1. Of all ſtones, it is the hardeſt.
  2. Is commonly clear, or tranſparent; which quality, however, may, perhaps, only belong to its cryſtals, but not to the rock itſelf from which they have their origin.
  3. Its ſpecific gravity is neareſt 3.500. When brought to Europe in its rough ſtate, it is in the form either of round pebbles with ſhining ſurfaces, or of chryſtals of an octoedral form.
  a. Colourleſs, or diaphonous, or the *diamond* properly ſo called.
    But it alſo retains this name when it is tinged ſomewhat red or yellow. Being rubbed, it diſcovers ſome electrical qualities, and attracts the maſtic.
  b. Red; Ruby. *Adamas ruber: Rubinus.*—Which, by lapidaries and jewellers, is, in regard to the colour, divided into,
    1. The ruby of a deep red colour inclining a little to purple,
    2. Spinell, of a dark colour.
    3. The balaſs, pale red, inclining to violet. This is ſuppoſed to be the mother of the rubies.
    4. The rubicell, reddiſh yellow.
      However, all others do not agree in the characters of theſe ſtones.

II. Sapphire. *Sapphyrus gemma.*

It is tranſparent, of a blue colour; and is ſaid to be in hardneſs next to the ruby, or diamond.

III. To-

Siliceous Earths. Gems.

III. Topaz. *Topazius gemma.*
- *a.* The pale yellow topaz; which is nearly uncoloured.
- *b.* The yellow topaz.
- *c.* Deep yellow, or gold coloured topaz, or oriental topaz.
- *d.* Orange-coloured topaz.
- *e.* The yellowiſh green topaz or *chryſolite.*
- *f.* The yellowiſh green, and cloudy topaz, the *chryſopraſe* (A)
- *g.* Bluiſh green topaz, or the beryl.

This varies in its colours; and is called, when
1. Of a ſea green colour, the *aqua-marina.*
2. When more green, the *beryl.*

IV. Emerald. *Smaragdus gemma.*

Its chief colour is green and tranſparent. It is the ſofteſt of precious ſtones and when heated it is phoſphoreſcent like the fluors.

V. To the precious ſtones belong alſo the jacinths, or hyacinths; which are chryſtals harder than quartz cryſtals, tranſparent, of a fine reddiſh-yellow colour when in their full luſtre, and formed in priſms pointed at both ends: theſe points are always regular, in regard to the number of the facets, being four on each point; but the facets ſeldom tally; the ſides alſo which form the main body, or column, are very uncertain in regard both to their number and ſhape; for they are found of four, five, ſix, ſeven, and ſometimes of eight, ſides: further the column or priſm is in ſome alſo ſo compreſſed, as almoſt to reſemble the face of a ſpherical facetted garnet.

Siliceous. Earths. Gems,

Mr Cronſtedt ſays, he got ſome jacinths of a quadrangular figure, which did not melt in the fire, but only became colourleſs.

VI. The amethyſt is a gem of a violet colour, with great brilliancy, and as hard as the beſt kind of rubies or ſapphires, from which it only differs by its colour. This is called the *oriental amethyſt;* and is very rare: when it inclines to the purple, or roſy colour, it is more eſteemed than when it is nearer to the blue.

Theſe amethyſts have the ſame figure, hardneſs, ſpecific gravity, and other qualities, as the beſt ſapphires or rubies; and come from the ſame places, particularly from Perſia, Arabia, Armenia, and the Weſt Indies.

The amethyſts called *occidental,* are of the ſame nature as rock cryſtals, and have the ſame gradations. viz. of a violet inclining to the purple

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(A) In the *Annals of Chemiſtry,* Vol. I. we have the following account of the method of digging for the chryſopraſes, and of the earths and ſtones with which it is accompanied.

This precious ſtone is found in certain mountains in Sileſia, which ſeem to begin thoſe of Tradas, extending to within half a league of Glatz. Theſe mountains appear, in general, to conſiſt of a number of ſtrata, horizontal or inclined, compoſed chiefly of ſubſtances containing magneſia, but likewiſe mixed with calcareous, argillaceous, and ſiliceous earths. The greateſt part of theſe conſiſt of ſerpentine, mixed with aſbeſtos and amianthus, grey argillaceous earths, boles, and red or green ochres, ſtone marrow, ſteatites, or ſoapſtone, and talc. In thoſe mountains alſo we meet with quartz, petroſilex, opal, and chalcedony, in detached fragments, and ſometimes in continued veins. We alſo diſcover in them veins of ſand, of the nature of granite. Sometimes the ſerpentine is met with at the ſurface; ſometimes at the depth of 20 or 30 feet. The ſtone marrow ſeems here to be produced by the decompoſition of a very milky ſpecies of opal agate named *cacholong;* for at the depth of 50 feet and upwards the veins of this ſoapy earth aſſume a degree of ſolidity, and we find nothing but hard and ſemitranſparent chacholongs.

The abovementioned ſtrata are croſſed by a great number of cracks filled with green-coloured earths and ſtones; but theſe frequently do not contain a ſingle true chryſopraſus. They are ſometimes found immediately under the vegetable mould, or at the depth of ſome feet, in ſhapeleſs maſſes, covered with a heavy clay, and ſometimes enveloped by an unctuous earth of a beautiful green colour, which it derives from the calx of nickel. In other places, the chryſopraſus has been found in uneven laminæ of ſeveral yards in length and breadth, either immediately under the mould, or in the upper ſtrata of ſerpentine, which have little ſolidity; and very beautiful ones have been found at the depth of ſeven or eight fathoms; and ſome have been met with in grey clay at the depth of four fathoms. In ſome places alſo they are met with in a kind of red ochre, which is attracted by the magnet; in others they are found in the clefts of rocks. The beautiful green chryſopraſus is found moſt plentifully in the mountain of Glaſſendorf. In another mountain named Koſemutz, where it is alſo found, the pieces are ſo porous, and ſo much ſpotted with white, &c. that ſometimes upwards of 1000 of them have not afforded one large enough for the uſe of the jewellers. The defects are frequently only diſcoverable on poliſhing, as the green opal, while rough, perfectly reſembles the chryſopraſus; but, on poliſhing the ſtones in which it is contained, it is detected by its want of luſtre.

The quantity in which theſe ſtones are found is not ſufficient to afford the expences of regular mining; the moſt profitable way, therefore, of obtaining them is by making trenches in the earth from four to ſix feet deep. Almoſt all the mountain of Koſemutz, however, has already been examined in this manner; ſo that they now dig for the chryſopraſus in quarries by uncovering a bank of earth or ſtone, and deſcending to other banks by ſteps in the open air, ſo as to throw the rubbiſh back from bank to bank. This method, however, cannot be continued farther than 24 or 30 feet, otherwiſe the produce would not defray the expence. The only tools employed in digging for the chryſopraſus are a ſpade and pick-ax; the former to remove the earth, the latter to detach the chryſopraſus itſelf from the ſtones which ſurround it.

Various accounts have been given of the component parts of this precious ſtone. Lehmann thinks, that the purple or roſy colour, or inclining to the blue; very often they are ſemi-tranſparent, without any colour in one end, and violet towards the other. The beſt are found in the Vic mountains of Catalonia in Spain, and at Wieſenthal in Saxony, as well as in Bohemia in Germany, in Italy, and in the province of Auvergne in France.

Cryſtals within the geodes, or hollow agathe-balls, are very often found of an amethyſt colour, and ſome are very fine.

What we call *amethyſt root*, or *mother of amethyſt*, is but a ſparry fluor, of which there are plenty in Derbyſhire: many fine ornamental pieces are made of this ſubſtance in different forms and ſhapes. Theſe ſpars are found in inſulated maſſes, ſometimes pretty large; but never in the form of large rocks.

VII. The garnet, *(Granatus.)* This ſtone, when tranſparent and of a fine colour, is reckoned among the gems: but it varies more than any, both in the form of its cryſtals and in its colour, ſome being of a deep and dark red, ſome yellowiſh and purpliſh, and ſome brown, blackiſh, and quite opaque. In general, their luſtre is leſs than that of other gems, as well as their hardneſs, which yields to the file, although they may ſtrike fire with ſteel. But as to their form, theſe cryſtals take almoſt all ſorts of figures, as the rhomboidal, tetradecaedral, &c. and ſome are of an irregular form.

Their colour proceeds from the iron which enters into their compoſition; and, according to M. de Sauſſure, even the fineſt oriental garnets attract the magnetic needle at a ſmall diſtance.

The Syrian garnet is the fineſt and beſt eſteemed. It is of a fine red, inclining to the purple colour, very diaphanous, but leſs brilliant than the oriental amethyſt. It ſeems to be the *amethyſtizontas* of Pliny: the Italians call it *rubino di rocca*,

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the colour of it is owing to ſome ferruginous particles modified in a particular manner: but the experiments he adduces for this opinion are not ſatisfactory. Mr Sage attributes the colour to cobalt from the blue colour it imparts to glaſs. Mr Achard thinks the ſtone contains calx of copper as well as calx of iron; becauſe a part of the metal ſeparable from it may be diſſolved in volatile alkali. The following are the experiments of M. Klaproth upon the ſubject.

1. On heating ſeveral pieces of very pure chryſopraſus red hot, and quenching them in water, the colour was changed from green to bluiſh grey: and, on repeating the operation, it became a white grey. They were found to have loſt in weight one and an half per cent. and were eaſily pulverable in a glaſs mortar.

2. Three hundred grains of chryſopraſus were mixed with double its weight of mild mineral alkali, and the mixture heated for ſome hours red hot, in a porcelain crucible. The maſs was then powdered, and digeſted in diſtilled water. By filtration, a yellowiſh grey reſiduum was obtained, weighing 44 grains; the filtered liquor was limpid and colourleſs, a copious precipitate being formed with muriatic acid, which being waſhed and dried was found to be ſiliceous earth.

3. The 44 grains of yellowiſh grey reſiduum were digeſted in a retort, with 352 grains of aqua regia; a great part of which was evaporated. The acid which came over was returned into the retort, and filtered after a ſecond digeſtion. The reſiduum was a very fine white ſiliceous earth, which, after being waſhed, dried, and heated red hot, weighed 20 grains.

4. The filtrated ſolution was of a pale green, but on ſuperſaturation with volatile alkali immediately turned of a bluiſh colour, precipitating a ſmall quantity of browniſh gelatinous matter; which, when collected, twice diſtilled with nitrous acid, and afterwards ſtrongly heated, yielded a brown calx of iron, weighing no more than a quarter of a grain: whence our author concludes, that iron does not contribute to the colour of the chryſopraſus, as we know many colourleſs ſtones which contain as great a quantity of that metal. This ſmall quantity of calx was left after digeſting the gelatinous reſiduum. On precipitating the ſoluble parts, they appeared to conſiſt of aluminous earth, in an exceſſively divided ſtate; which being waſhed and dried, weighed half a grain.

5. To find whether the ſolution contained calcareous earth or not, he mixed with that, ſuperſaturated with volatile alkali, a ſaturated ſolution of mild mineral alkali, which precipitated four grains and an half of white and very pure calcareous earth.

6. Nothing more was precipitated from the ſolution, either by acids or alkalies, after the ſeparation of the calcareous earth, though it ſtill retained a bluiſh colour. It was poured into a retort, and evaporated to dryneſs; the reſiduum was of a yellowiſh colour, which became green on being diſſolved in diſtilled water. Mild mineral alkali threw down only a little earth of a greeniſh white colour; which being re-diſſolved in dephlogiſticated nitrous acid, and precipitated with Pruſſian alkali, the liquor yielded 17 grains of a ſea-green powder. This precipitate, in our author's opinion, is the colouring principle of the chryſopraſus; and this principle he afterwards found to be calx of nickel.

7. Our author likewiſe attempted to analyſe the chryſopraſus in the moiſt way by concentrated vitriolic acid; in which proceſs his chief view was to diſcover whether the ſtone contained any volatile particles or not. On an ounce of crude chryſopraſus, therefore, when put into a retort, he poured an equal quantity of rectified vitriolic acid, and two parts of diſtilled water. After the latter had paſſed over into the receiver, the fire was increaſed to force over the ſuperabundant acid; a part aroſe in white vapours, and ſome fell into the receiver with an hiſſing noiſe. Boiling water, which had been diſtilled, was then poured upon the reſiduum, and the ſolution filtered. The powdered chryſopraſus left on the filter had not been perfectly diſſolved, and, in

rocca, and is found in Syria, Calcutta, Cananor, Camboya, and Ethiopia.

The fine garnet of a red inclining to a yellow colour, is the *ſoranus* of the ancients, the *vermeille* of the French, and the *giacinto guarnacino* of the Italians. Its name is taken from *Sorian*, or *Surian*, a capital town of Pegu, from whence theſe gems are brought: when they have a browniſh taint, they are then called *hyacinths*.

The occidental garnet is of a deep and dark red, and its hardneſs is leſſer. However, ſome very fine hard garnets are found in Bohemia.—Garnets are alſo found in Hungary, at Pyrna in Sileſia, at S. Sapho in the canton of Berne, in Spain, and in Norway.

The garnet melts in the focus of a good burning glaſs into a brown maſs, which is attracted by the loadſtone; and this ſhows that iron enters conſiderably into its compoſition.

Some garnets are found, which contain a little gold. Thoſe called *zingraupen* by the Germans contain tin.

VIII. Tourmalin; *Lapis electricus*.

This is a kind of hard ſtone, lately brought into notice by its electrical properties. See TOURMALIN.

1. Its form is a priſm of nine ſides of different breadths, moſtly truncated, and ſeldom terminating in a pyramid at each end, which is either compoſed of three pentagons, or of nine triangles.
2. When heated in the fire, it gives ſigns of contrary electricity on the two oppoſite ends of their priſmatic form. But many of theſe ſtones are not in the leaſt electric. However, on being rubbed, they become electric in their ſides, like other diaphanous gems.
3. It is as hard almoſt as the topaz, and ſtrikes fire with ſteel.
4. It melts by itſelf in a ſtrong fire, though with difficulty.
5. With the microcoſmic ſalt it melts perfectly; but only in part with borax.
6. With mineral alkali it is divided into a kind of powder.
7. The three mineral acids diſſolve it when firſt reduced to a powder.
8. It bears a greater ſimilarity to ſchoerl than to any other ſtone: but its component parts ſhow

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in general, had undergone but little alteration, ſo that he could not by this method determine the component parts. M. Achard, however, was more ſucceſsful, and by a ſimilar method determined the component parts of this gem to be five grains of an earth, which, diſtilled with vitriolic acid, became volatile; eight grains of calcareous earth, ſix grains of magneſia, two grains of calx of iron, three grains of calx of copper, and 456 of ſiliceous earth.

M. Klaproth never met with any volatile earth or magneſia in his experiments on this gem; and therefore concludes, that the chryſopraſus uſed by him had been eſſentially different from that made uſe of by M. Achard; and he ſeems not to give credit to the account of any copper being found in it.

8. One part of crude chryſopraſus, well powdered and waſhed with two parts of mild vegetable alkali, yielded a violet-coloured glaſs, which in the atmoſphere ran into a browniſh-coloured liquor.

9. Five parts of the gem, with four of mild alkali, gave a beautiful violet-coloured glaſs after being two hours in fuſion.

10. Equal parts of crude chryſopraſus and mild mineral alkali, yielded a tranſparent glaſs in thin laminæ, of a brown colour, reſembling that of the tourmalin, the ſurface being marked with fine reticulated veins; which veins aroſe from ſmall grains of very fine reduced nickel placed in lines againſt one another.

11. Equal parts of crude chryſopraſus and calcined borax, gave a clear, tranſparent, and brown glaſs, reſembling the ſmoky topaz.

12. Equal parts of chryſopraſus, extracted by vitriolic acid and calcined borax, yielded a ſimilar glaſs of a clear brown colour; "which proves (ſays our author), that the vitriolic acid was incapable of perfectly analyſing the chryſopraſus, though I had uſed a double portion of the earth."

13. Eighty grains of prepared ſiliceous earth, ſixty grains of mild fixed alkali, with the three grains of calx of nickel procured from the chryſopraſus, yielded a beautiful, clear, and violet-coloured glaſs.

14. On ſubſtituting three grains of calx produced from an ore of nickel, a glaſs was produced exactly like the former.

15. Sixty grains of prepared ſiliceous earth and calcined borax, with three grains of calx of nickel from the chryſopraſus, yielded a tranſparent glaſs of a clear brown colour.

16. Sixty grains of prepared ſiliceous earth and vitrified phoſphoric acid, with three grains of calx of nickel from the chryſopraſus, gave a glaſs of the colour of honey.

17. Thus the attempts of M. Klaproth to recompoſe the chryſopraſus proved abortive. From his experiments, however, he deduces the following concluſions: 1. The blue colour obſervable in the glaſs produced by fuſing the chryſopraſus with vegetable alkali, ariſes entirely from the nickel contained in the gem: and the experiment ſhows that the calx of nickel, when purified as much as poſſible, has the ſurpriſing property of tinging glaſs frits prepared with vegetable alkali of a blue colour. "But (ſays he) why was not this colour alſo obtained with ſoda? and what is the cauſe of a difference ſo little to be expected?" 2. By theſe experiments the ſuppoſition of M. Sage is refuted, that the metallic matter which colours the chryſopraſus is cobalt: "many metallic ſubſtances beſides cobalt, it is well known, give by certain proceſſes a blue glaſs; thus

cobalt,

ſhow that it may be ranged with propriety in this place, along with other precious ſtones: as the argillaceous earth is alſo the moſt prevalent in its compoſition.

a. The oriental tourmalines are found in the iſland of Ceylon. They are tranſparent, of a dark brown yellow; and their ſpecific gravity is from 3062 to 3295.

b. From Braſil. Tranſparent. Theſe are green for the moſt part; but there are alſo ſome red, blue, and yellow: their ſpecific gravity is from 3075 to 3180.

c. From Tyrol. Of ſo dark a green as to appear opaque. Their ſpecific gravity is about 3050. Theſe are found in beds of ſteatites and lapis-ollaris, among the micaceous veins, talcs, and hornblende of Schneeberg, Jurzagl, and Zillerthal, in the mountains of Tyrol.

d. From the mountains of Old Caſtile in Spain. Theſe are tranſparent, and have the ſame properties as the preceding ones.

IX. The opal, *Opalus*; the *girasole* of the Italians.—This is the moſt beautiful of all the flint kind, owing to the changeable appearance of its colours by reflection and refraction, and muſt therefore be deſcribed under both theſe circumſtances.

1. The opal of Nonnius, the *Sangenon* of the Indians. This appears olive-coloured by reflection, and ſeems then to be opaque; but when held againſt the light, is found tranſparent and of a fine ruby red colour.

There is, however, another of the ſame kind in Sweden, which by reflection appears rather brown; but by refraction it is red, with violet veins.

2. The white opal. Its ground is white, of a glaſs-like complexion, from whence are thrown out green, yellow, purple, and bluiſh rays; but it is of a reddiſh or rather flame-colour when held againſt the light.

a. Of many colours; the oriental opal.

b. Of a milky colour.

c. Bluiſh, and ſemi-tranſparent. This is not ſo much valued as thoſe which are more opaque, becauſe it is eaſier to be imitated by art.

§ 2. *Of Quartz.*

This ſtone is very common in Europe, and eaſier to be known than deſcribed. It is diſtinguiſhed from the other kinds of the ſiliceous order by the following qualities:

1. That it is moſt generally cracked throughout, even in the rock itſelf; whereby,
2. As well as by its nature, it breaks irregularly, and into ſharp fragments.
3. That it cannot eaſily be made red-hot without cracking ſtill more.
4. It never decays in the air.
5. Melted with pot-aſhes, it gives a more ſolid and fixed glaſs than any other of the ſiliceous order.
6. When there has been no interruption in its natural accretion, its ſubſtance always cryſtalliſes into hexagonal priſms pointed at one or both ends.
7. It occurs in clefts, fiſſures, and ſmall veins in rocks. It very ſeldom forms large veins, and ſtill ſeldomer whole mountains, without being mixed with heterogeneous ſubſtances.

According to Mr Kirwan, quartz neither loſes its hardneſs nor its weight by calcination. Its texture is lamellar. Theſe ſtones are in general the pureſt of the ſiliceous kind, though moſt contain a ſlight mixture of other earths; the moſt obvious diſtinction among them ariſes from their tranſparency or opacity.

Quartz is found,

(1.) Pure.

A. Solid, of no viſible particles, with a gloſſy ſurface. Fat Quartz.

a. Uncoloured and clear. This has no cryſtallized form, but is neverthelefs as clear as quartz cryſtals of the beſt water.

b. White, the common fat quartz.

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cobalt gives a blue colour to combinations of the mineral alkali with phoſphoric acid, to mineral alkali itſelf, to potaſh, and to borax. The acid of tungſten (falſely ſo called) alſo gives a blue colour to frits made with phoſphoric ſalts, but not to thoſe made with borax; the calx of nickel gives a blue colour only to frits made with potaſh, brown to thoſe with mineral alkali and borax, and yellow, like honey, to combinations of phoſphoric acid with mineral alkali." 3. As the chryſopraſus gives a brown colour with borax, and the ſolution of this ſtone in muriatic acid gives no ſigns of cobalt diſſolved in the ſame acid; this ſhows that there is no cobalt in the ſtone. Mr Sage, indeed, pretends, that he has obtained a blue glaſs from the chryſopraſus and borax; but this is contradicted by experience. 4. The mineralogical character of the chryſopraſus, therefore, is a quartz coloured green by nickel. Three hundred grains of it contain $288\frac{1}{2}$ of ſiliceous earth calcined to redneſs, one quarter of a grain of pure aluminous earth, two grains and an half of calcareous earth calcined to redneſs, three grains of calx of nickel, and one quarter of a grain of calx of iron. All theſe were extracted in the experiments; and there were beſides five grains and an half of waſte.

Our author mentions, that in the collections of chryſopraſus which have been brought to him, he has conſtantly obſerved green opal, in bits of vein from half an inch to an inch, and fixed in its borders: the reddiſh, yellow, and white opals, on the contrary, are generally met with on a green or browniſh petroſilex. But the white opal, which, as well as the green, is found in pieces of the nature of matrix, differs from the true opal, approaching the chalcedony and the opaque milky quartzes. This kind of tranſparent opal, radiated with a whitiſh blue, contains the following ingredients in its compoſition: Siliceous earth, 237 grains; aluminous earth, a quarter of a grain; calx of iron, a quarter of a grain—in all, $237\frac{1}{2}$ grains. In 240 grains were two and an half of waſte. The colour of this ſtone, as well as the chryſopraſus, in our author's opinion, is derived from nickel.

Siliceous Earths Gems.

c. Blue.

d. Violet.

B. Grained.

a. White. *b.* Pale green.

C. Sparry quartz.

This is the ſcarceſt; and ought not to be confounded with the white felt-ſpar, being of a ſmoother appearance, and breaking into larger and more irregular planes.

a. Whitiſh yellow. *b.* White.

D. Cryſtaliſed quartz. Rock cryſtal. Quartz cryſtal.

1. Opaque, or ſemi-tranſparent.

a. White, or of a milk colour.

b. Red, or of a carnelian colour.

c. Black.

2. clear.

a. Blackiſh brown, ſmokey topaz, or *raunch topaz* of the Germans.

b. Yellow; found in Bohemia, and ſold inſtead of topazes.

c. Violet; the amethyſt from Saxony, Bohemia, and Dammemore in Upland (B.)

d. Uncoloured: rock cryſtal, properly ſo called. When theſe coloured cryſtals are not clear, they are called *fluſs;* for inſtance, *topaz-fluſs*, *amethyſt-fluſs*, &c (c.)

(2. Impure quartz.

A. Mixed with iron, in form of a black calx.—This is of a gloſſy texture, and contains a great quantity of iron.

B. Mixed with copper in form of a red calx.

a. Red.

§ 3. *Of Flints.*

THE flint (*Silex pyromachus*, *Lapis corneus*, or the *hornſtein* of the Germans) forms a kind of intermediate ſubſtance between quartz and jaſper; both which, however, it ſo nearly reſembles, that it is not eaſy to point out ſuch characters as ſhall readily diſtinguiſh it from them. We can only, therefore, ſpeak of its properties comparatively.

1. It is more uniformly ſolid, and not ſo much cracked in the maſs as the quartz; and,
2. It is more pellucid than the jaſper.
3. It bears being expoſed to the air without decaying better than the jaſper, but not ſo well as the quartz.
4. It is better for making of glaſs than the jaſper, but is not quite ſo good as quartz for that purpoſe.
5. Whenever there has been an opportunity in this matter of its ſhooting into cryſtals, quartz cryſtals are always found in it; juſt as if the quartz made one of its conſtituent parts, and had in certain circumſtances been ſqueezed out of it; this is to be ſeen in every hollow flint and its clefts, which are always filled up with quartz.
6. It often ſhows moſt evident marks of having been originally in a ſoft and ſlimy tough ſtate like glue or jelly.

The ſeveral varieties of this ſpecies have obtained more diſtinct names with reſpect to their colours than from any real difference in their ſubſtance; but theſe are ſtill neceſſary to be retained, as the only names uſed by jewellers and others, who know how to value them accordingly.

I. Jade. *Lapis nephriticus. Jaſpachates.*

The true lapis nephriticus ſeems to belong to this ſiliceous order, as it gives fire with ſteel, and is ſemi-pellucid like flint; it does not harden

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(B.) The moſt tranſparent are called *falſe diamonds*, *Briſtol*, *Kerry ſtones*, and *Alençon diamonds*, &c. The coloured tranſparent cryſtals derive their tinge generally from metallic calces, though in exceeding ſmall portions: they all loſe their colours when ſtrongly heated. Theſe are what we call falſe gems, viz.

The *red*, from Oran in Barbary, *falſe rubies*.

The *yellow*, from Saxony, *falſe topazes*,

The *green*, from Dauphiny, (very rare) *falſe emeralds*, or *praſes*.

The *violet*, from Vil in Catalonia, *falſe amethyſts*.

The *blue*, from Puy in Valay, France, *falſe ſapphires*.

There are alſo *opal*, or *rainbow cryſtals*, ſome of which make a very fine appearance; the various colours of which are thrown out in zones acroſs the ſurface, though they never ſhine like the oriental opal.

(c) M. Fourcroy makes a remarkable difference between the cryſtals and the quartz, by affirming that the former are unalterable in the fire, in which they never loſe their hardneſs, tranſparency, nor colour; whilſt the quartz loſes the ſame qualities, and is reduced by it to a white and opaque earth. He claſſes the rock cryſtals,

1ſt, According to their *form*, viz. 1. Inſulated-hexagonal-cryſtals, ending in two pyramids of ſix faces, which have a double refraction or ſhow two images of the ſame object when looked through. 2. Hexagonal cryſtals united, having one or two points. 3. Tetrædral, dodecædral, flated cryſtals, and which though hexagonal have nevertheleſs their planes irregular. 4. Cryſtals in large maſſes, from the iſland of Madagaſcar, which have a ſimple refraction

2dly, As to the colour, they are either diaphonous, rediſh, ſmokey, or blackiſh.

3dly, As to accidental changes, ſome are *hollow*; ſome contain *water* within one or more cavities: ſome are caled, viz. one within the other: ſome are of a round form, as the pebbles of the Rhine; ſome have a cruſt of metallic calces, or of a pyrites: ſome are of a geodical form, viz, cryſtalliſed in the inſide of a cavity: ſome ſeem to contain amianthe, or aſbeſtus, and others contain ſhirls.

The ſame author reckons among cryſtals, the oriental topaz, the hyacinth, the oriental ſapphire, and the amethyſt. Mr Daubenton had always looked on this laſt as a quartzous cryſtal.

den in fire, but melts by the ſolar heat in the focus of a burning lens into a tranſparent green glaſs with ſome bubbles. That called by the name of *circonciſion ſtone*, which comes from the Amazon river, melts eaſier, in the ſame ſolar fire, into a brown opaque glaſs, which is far leſs hard than the ſtone itſelf. *(Macquer.)*

This ſtone is ſuperior in hardneſs to quartz, though from its unctuoſity to the touch, one would ſuſpect it to contain a large portion of argillaceous earth, or rather of magneſian earth, as Mr Kirwan ſeems to ſuſpect.

Its ſpecific gravity is from 2,970 to 3,389.—It is of a granular texture, of a greaſy look, and exceedingly hard: is ſcarcely ſoluble in acids, at leaſt without particular management, and is infuſible in the fire. M. Sauſſure ſeems to have extracted iron from it.

a. It is ſometimes of a whitiſh milky colour, from China: but moſtly
b. Of a greeniſh, or
c. Deep-green colour, from America.
d. Grey, yellowiſh, and olive colour: theſe are the vulgar *lapis nephriticus*, they being ſuppoſed to cure the nephritic pains by their external application to the loins.

The ſemi-pellucidity, hardneſs, and ſpecific gravity, are the characters by which the lapis nephriticus may be diſtinguiſhed from other ſtones.

II. Cat's eye; *Pſeudopalus*. The ſun-ſtone of the Turks, called *guneche*.

This ſtone is opaque, and reflects green and yellowiſh rays from its ſurface: it is found in Siberia. It is very hard and ſemi-tranſparent, and has different points, from which light is reflected with a kind of yellow-brown radiation, ſomewhat ſimilar to the eyes of cats, from whence it had its name. Jewellers do not fail to cut them round to the greateſt advantage. The beſt of theſe ſtones are very ſcarce. One of theſe of one inch diameter was in the cabinet of the grand duke of Tuſcany.

III. *Hydrophanes*, or *Oculus Mundi*; alſo called *Lapis mutabilis*.

The principal property which diſtinguiſhes this from all other ſtones, is that it becomes tranſparent by mere infuſion in any aqueous fluid; but it gradually reſumes its opacity when dry.

IV. The onyx. *Onyx camehuja.* Memphites. It is found of two ſorts.
a. Nail-coloured onyx, having pale fleſh-coloured and white lines.
b. With black and white lines. The oriental onyx.

V. The chalcedony, or white agate, is a flint of a white colour, like milk diluted with water, more or leſs opaque: it has veins, circles, and round ſpots. It is ſaid to be ſofter than the onyx, but much harder than thoſe agates which are ſometimes found of the ſame colour.
a. The white opaque Chalcedony, or *cahолong*, from the Buckhariſh Calmucks. This was firſt made known by one Renez, a Swediſh officer, who for ſeveral years had been in the country. The inhabitants find this flint on the banks of their rivers and work idols and domeſtic veſſels out of it.
b. Of white and ſemi-tranſparent ſtrata; from Ceylon.
c. Bluiſh grey: from Ceylon and Siberia.

VI. The carnelian. *Carniolus*.

Is of a browniſh red colour, and often entirely brown. Its name is originally derived from its reſemblance to fleſh, or to water mixed with blood.
a. Red.
b. Yellowiſh brown, looks like yellow amber. It is ſaid not to be ſo hard as the chalcedony.

VII. The ſardonyx.

This is a mixture of the chalcedony and carnelian, ſometimes ſtratumwiſe, and ſometimes confuſedly blended and mixed together.
a. Stripped with white and red ſtrata; this ſerves as well cut in cameo as the onyx.
b. White, with red dendritical figures. This very much reſembles that agate which is called the *mocha ſtone*; but with this difference, that the figures are of a red colour in this, inſtead of black, as in that agate.

Between the onyx, carnelian, chalcedony, ſardonyx, and agate, there ſeems to be no real difference, except ſome inexplicable degrees of hardneſs.

VIII. The agate; *Achates*.

This name is given to flints that are variegated with different colours, promiſcuouſly blended together: and they are eſteemed in proportion to their mixture of colours, their beauty, and elegance. Hence alſo they have obtained variety of names, moſtly Greek, as if the buſineſs of the lapidary in cutting of them, and admiring their ſeveral beauties and figures, had been derived from that nation alone. (D).
a. Brown opaque agate, with black veins, and dendritical figures: the Egyptian pebbles.
b. Of a Chalcedony colour; *achates chalcedoniſans*.
c. Semi-tranſparent, with lines of a blackiſh brown colour, and dendritical figures; the mocha ſtone.
d. Semi-tranſparent, with red dots; *Gemma divi Stephani*. When the points are very minute, ſo as to give the ſtone a red appearance, it is by ſome called *Sardea*.

(D) On the ſide of a hill near the church of Rothes in Moray, is a quantity of fine agate of elegant red and white colours. It is very hard, heavy, of a ſmooth uniform texture, and of a conſiderable brightneſs; in which the red are remarkably clear, and finely mixed and ſhaded through the ſtone. Mr Willams ſays that this is the largeſt and moſt beautiful agate rock he ever ſaw; and ſo fine and hard as to be capable of the higheſt luſtre in poliſhing.

e. Semi tranſparent, with clouds of an orange colour.

f. Deep red or violet, and ſemi tranſparent.

g. Of many colours, or variegated.

h. Black.

IX. Common Flint; *Pyromachus*.

This in reality, is of the ſame ſubſtance as the agate; but as the colours are not ſo ſtriking or agreeable, it is commonly conſidered as a different ſubſtance.

a. Blackiſh grey, from the province of Skone.

b. Yellow ſemi-tranſparent, from France.

c. Whitiſh grey.

d. Yellowiſh brown.

When the flints are ſmall, they are in England called *pebbles;* and the Swediſh ſailors, who take them as ballaſt, call them *ſingel*.

X. Chert; *Petroſilex, Lapis Corneus*. The *hornſtein* of the Germans.

This is of a coarſer texture than the preceding, and alſo leſs hard, which makes it conſequently not ſo capable of a poliſh. It is ſemi-tranſparent at the edges, or when it is broke into very thin pieces.

a. Chert of a fleſh colour, from Carl-Scakt, at the ſilver-mine of Salberg, in the province of Weſtmanland.

b. Whitiſh yellow, from Salberg.

c. White, from Kriſtierſberg, at Nya Kopparberget in Weſtmanland.

d. Greeniſh, from Preſtguvſan, at Heileſors in Weſtmanland.

Chert runs in veins through rocks, from whence its name is derived. Its ſpecific gravity is from 2590 to 2700. In the fire, it whitens and decrepitates like ſilex, but is generally ſo fuſible as to melt *per ſe*. It is not totally diſſolved in the dry way by the mineral alkali; but borax and microcoſmic ſalt diſſolve it without efferveſcence, Its appearance is duller and leſs tranſparent than common flint. The reddiſh Petro-ſilex uſed in the Count de Lauragar's procelain manufacture, and called there *felt ſpat.* contained 72 *per cent.* of ſilex, 22 of argill, and 6 of calcareous earth.

There are not yet any certain characters known by which the cherts and jaſpers may be diſtinguiſhed from each other: by ſight, however, they can eaſily be diſcerned, viz. the former (the cherts) appearing tranſparent, and of a fine ſparkling texture, on being broken; whereas the jaſper is grained, dull, and opaque, having the appearance of a dry clay; The chert is alſo found forming larger or ſmaller veins, or in nodules like kernels in the rocks; whereas the jaſper, on the contrary, ſometimes conſtitutes the chief ſubſtance of the higheſt and moſt extended chain of mountains. The chert is likewiſe found plentifully in the neighbourhood of ſcaly limeſtone, as flints in the ſtrata of chalk. What connection there may be between theſe bodies, perhaps time will diſcover.

But flints and agates being generally found in looſe and ſingle irregular nodules, and hardly in rocks, as the chert, it is a circumſtance very inſufficient to eſtabliſh a difference between them; for there is the agate-ſtone, near Conſtantinople, running vein-like acroſs the rock with its country of the ſame hardneſs, and as fine and tranſparent as thoſe other agates which are found in round nodules at Deux-ponts. We muſt, therefore, content ourſelves with this remark concerning flints, viz. That they ſeem to be the only kind of ſtone hitherto known, of which a very large quantity has been formed in the ſhape of looſe or ſeparate nodules, each ſurrounded with its proper cruſt; and that the matter which conſtitutes this cruſt has been ſeparated from the reſt of the ſubſtance, in like manner as ſandiver or glaſs-gall ſeparates from, and ſwims upon, glaſs, during its vitrification; though ſometimes the formation of this cruſt may be prevented by the too ſudden hardening of the matter itſelf.

Other ſpecies of ſtones, which are found in looſe pieces or nodules, except ores and ſome ſorts of ſtalactites, ſhow evidently by their cracks, angles, and irregular figures, that they have been torn from rocks, rolled about, and rubbed againſt one another in torrents, or by ſome other violent motions of water.

That flints had originally been in a ſoft ſtate, M. Cronſtedt obſerves, is eaſy to be ſeen in the Egyptian pebbles, which have impreſſions of ſmall ſtones, ſand, and ſometimes, perhaps, graſs; which, however, have not had any ingreſs into the very flint, but ſeem only to have forced the above agate gall or cruſt out of the way.

§ 4. Of Jaſpers

JASPER, *jaſpis*, (the *d'iaſpro* of the Italians), is a name given to all the opaque flints whoſe texture reſembles dry clay and which have no other known quality whereby they may be diſtinguiſhed from other flints, except that they may be more eaſily melted in the fire; and this quality perhaps may proceed from the heterogeneous mixture, probably of iron.

I. Pure jaſper; which by no means yet known can be decompounded.

a. Green with red ſpecks or dots: the *heliotrope*, or blood-ſtone. *b*. Green: *c*. Red, *d*. Yellow. *e*. Red with yellow ſpots and veins. *f* Black.

II. Jaſper containing iron: *Jaſpis martiales Simple.*

A coarſe-grained.

a. Red and reddiſh brown; *ſimple.*

B. Steel-grained, or fine-grained.

a. Reddiſh brown; looks like the red ochre or chalk uſed for drawing; and has partition veins, which are unctuous to the touch, like a fine clay, and other like kinds.

C. Of a ſolid and ſhining texture, like a flag.

a. Liver-coloured; and, *b*, Deep red. *c*. Yellow. This laſt mentioned, when calcined, is attracted by the loadſtone: and being aſſayed, yields from 12 to 15 *per cent.* of iron. (E.)

§ 5

(E) Near Portſoy in Banff-ſhire is an extenſive rock of jaſper; ſome parts of which contain a beautiful mixture of green and red, which appear finely ſhaded and clouded through the body of the ſtone when poliſhed. Mr Williams is of opinion that it would be a very valuable quarry if worked.

§ 5. *Felt-ſpars.*

I. Rhombic quartz; *Spatum ſcintillans.*

This has its name from its figure, but ſeems to be of the ſame ſubſtance as the jaſper. We have not, however, ranked them together, for want of true marks to diſtinguiſh the different ſorts of the flinty tribe from one another.

This kind is found,

1. Sparry.

a. White. *b.* Reddiſh brown. *c.* Pale yellow. *d.* Greeniſh.

2. Cryſtallized.

a. In ſeparate or diſtinct rhomboidal cryſtals.

II. Labradore ſtone; *Spatum rutilum verſicolor.*

Its colour is commonly of a light or of a deep grey, and moſtly of a blackiſh grey: but when held in certain poſitions to the light, diſcovers different varieties of beautiful ſhining colours, as lazuly-blue, graſs-green, apple-green, pea-green; and ſeldom a citron-yellow; ſome have an intermediate colour betwixt red-copper and tombac-grey; beſides other colours between grey and violet. Theſe colours are ſeen for moſt part in ſpots; but ſometimes in ſtripes, on the ſame piece.

III. White feltſpar; *Terra Silicea Magneſia & ferro intimè mixta.*

This ſtone has been deſcribed by Mr Bayen: and is found at St Marie aux mines in Lorrain.—It is of a white opaque colour, ſpotted with ochre on the outſide.

§ 6. *Of the Garnet Kinds.*

The ſubſtances of this *genus* (which is conſidered by Cronſtedt as an *order*) are analogous to gems; ſince all theſe are compoſed of the ſiliceous, calcareous, and argillaceous earths, with a greater or leſs proportion of iron. The opaque and black garnets contain about 20 hundredths of iron: but the diaphanous ones only two hundredths of their weight, according to Bergman. The garnets, properly ſo called, contain a greater quantity of ſiliceous earth than the ſhirls, and both are now juſtly ranked with the ſiliceous earths.

The ſpecies are,

I. Garnet; *Granatus.*

This is a heavy and hard kind of ſtone, cryſtallizing in form of polygonal balls, and moſtly of a red, or reddiſh brown colour.

A. Garnet mixed with iron; *Granatus martialis.*

1. Coarſe-grained garnet-ſtones, without any particular figure; in Swediſh called *Granatberg*; in German, *Granatſtein.*

a. Reddiſh-brown garnet. *b.* Whitiſh yellow. *c.* Pale yellow.

2. Cryſtallized garnet.

a. Black. *b.* Red: ſemi-tranſparent, and cracked; tranſparent. *c.* Reddiſh-yellow; tranſparent; the jacinth, or hyacinth. *d.* Reddiſh brown. *e.* Green. *f.* Yellowiſh-green. *g.* Black.

B. Garnet mixed with iron and tin.

1. Coarſe-grained, without any particular figure.

a. Blackiſh-brown.

2. Cryſtallized.

a. Blackiſh brown.

b. Light-green or white.

C. Garnet mixed with iron and lead.

1. Cryſtallized.

a. Reddiſh-brown.

II. Cockle, or ſhirl. *Corneus cryſtallizatus Wallerii; Stannum cryſtallis columnaribus nigris Linnæi.*

This is a heavy and hard kind of ſtone which ſhoots into cryſtals of a priſmatical figure, and whoſe chief colours are black or green. Its ſpecific gravity is the ſame as the garnets, viz. between 3000 and 3400, though always proportionable to their different ſolidity.

A. Cockle, or ſhirl, mixed with iron.

1. Coarſe, without any determined figure.

a. Green.

2. Sparry.

a. Deep green, (the mother of the emeralds), from Egypt.

b. Pale green.

c. White. This occurs very frequently in the ſcaly limeſtones; and its colour changes from deep green to white, in proportion as it contains more or leſs of iron.

3. Fibrous, ſtriated cockle, or ſhirl: it looks like fibres or threads made of glaſs.

A. Of parallel fibres. *a.* Black. *b.* Green. *c.* White.

B. Of concentrated fibres: The ſtarred cockle, or ſhurl, from its fibres being laid ſtellarwiſe.

a. Blackiſh green. *b.* Light green. *c.* White.

4. Cryſtallized cockle, or ſhirl.

a. Black. To this variety belong moſt of thoſe ſubſtances called *imperfect aſbeſti*; and as the cockle perfectly reſembles a ſlag from an iron furnace, both in regard to its metallic contents and its glaſſy texture, it is no wonder that it is not ſoft enough to be taken for an aſbeſtus. It has, however, only for the ſake of its ſtructure, been ranked among the aſbeſti. The ſtriated cockle, or ſhirl, compared to the aſbeſti, is of a ſhining and angular ſurface (though this ſometimes requires the aid of the magnifying-glaſs to be diſcovered) always ſomewhat tranſparent, and is pretty eaſily brought to a glaſs with the blow-pipe, without being conſumed as the pure aſbeſti ſeem to be.

b. Deep green.

c. Light green.

d. Reddiſh brown. The *tauffstein* is of this colour, and conſiſts of two hexagonal cryſtals of cockle grown together in form of a croſs; this the Roman Catholics wear as an amulet, and is called in Latin *lapis crucifer*, or the croſs ſtone.

The figure of the cockle cryſtals is uncertain, but always priſmatical: the cockle from Yxſio, at Nya Kopparberg, is quadrangular: the French kind has nine ſides or planes; and the tauffstein is hexagonal.

The name *cockle* for theſe ſubſtances is an old Corniſh mineral name; but is alſo given ſometimes to other very different matters.

We

Siliceous Earths. Gems.

There is not in England any great quantity of ſpecies of cockles; the chief are found in the tin mines of Cornwall, and ſome fine cryſtallized kinds have been brought from Scotland.

The Engliſh mineral name of *call*, has been uſed by ſome authors as ſynonymous with *cockles*, and they are confounded together at the mines; but the call, definitely ſpeaking, is the ſubſtance called *wolffram* by the Germans, &c.

Garnets, though ſmall, are often found in micaceous ſtones in England; but extreme good garnets are found in great plenty alſo in like ſtones in Scotland.

III. Rowley rag, *(Kirwan)*. This ſtone is of a duſky or dark grey colour, with numerous minute ſhining cryſtals. Its texture is granular: by expoſure to the air it acquires an ochry cruſt. Its ſpecific gravity is 2748. Heated in an open fire it becomes magnetic. In ſtrong heat it melts *per ſe*, but with more difficulty than baſaltes. According to Dr Withering's analyſis, 100 parts of it contain 47,5 of ſiliceous earth, 32,5 of argil, and 20 of iron.

IV. Siliceous muriatic ſpar, *(Id.)* This ſtone is of a hard, ſolid, and ſparry texture; of a grey, ochry, dull colour, but internally bright. It gives fire with ſteel: yet it efferveſces with acids. In a ſtrong heat it grows brown; but at laſt it melts *per ſe*. One hundred parts of this ſtone contain fifty parts of ſilex: the remainder is mild magneſia and iron; but in what proportion is not mentioned (See *Journal de Phyſique*, Supplement, vol. xiii. p. 216.

V. Turky ſtone; *cos Turcica*. *(Id.)* This ſtone is of a dull white colour, and often of an uneven colour, ſome parts appearing more compact than others, ſo that it is in ſome meaſure ſhattery. It is uſed as a whetſtone: and thoſe of the fineſt grain are the beſt hones for the moſt delicate cutting tools, and even for razors, lancets, &c. Its ſpecific gravity is 2598. It gives fire with ſteel; yet efferveſces with acids. Mr Kirwan found that 100 parts of it contains 25 of mild calcareous earth, and no iron. There probably are two ſorts of ſtones known by this name, as Mr Wallerius affirms, that which he deſcribes neither to give fire with ſteel nor efferveſce with acids.

VI. Ragg ſtone. The colour of this ſtone is grey. Its texture is obſcurely laminar, or rather fibrous, but the laminæ or fibres conſiſt of a congeries of grains of a quartzy appearance, coarſe and rough. Its ſpecific gravity is 2729. It efferveſces with acids; and gives fire with ſteel. Mr Kirwan found it to contain a portion of mild calcareous earth, and a ſmall proportion of iron. It is uſed as a whet-ſtone for coarſe cutting tools.

[The ſiliceous grit, *cos arenarius*, and other compounds of the ſiliceous earth, &c. will be found in a ſubſequent diviſion of this article.]

Obſervations on the œconomical Uſes of the Siliceous Order.

The Europeans have no farther trouble with the precious ſtones than either to cut them from their natural or rough figure, or to alter them when they have been badly cut in the Eaſt Indies; in which latter circumſtances they are called *labora*: and it may be obſerved, that for cutting the ruby, ſpinell, ballas, and chryſolite, the oil of olive is required, inſtead of any other liquid, to be mixed with the diamond powder, in the ſame manner as for cutting the diamond itſelf.

Siliceous Earths. Gems.

If the petty princes in theſe parts of the Indies, where precious ſtones are found, have no other power nor riches proportionable to the value of theſe gems, the reaſon of it is as obvious as of the general weakneſs of thoſe countries where gold and ſilver abound, *viz.* becauſe the inhabitants, placing a falſe confidence in the high value of their poſſeſſions, neglect uſeful manufactures and trade, which by degrees produces a general idleneſs and ignorance through the whole country.

On the other hand, perhaps, ſome countries might ſafely improve their revenues by ſuch traffic. In Saxony, for example, there might probably be other gems found beſides aqua marines and topazes; or even a greater trade carried on with theſe than at preſent, without danger of bad conſequences, eſpecially under the direction of a careful and prudent government.

The *half-precious* ſtones, ſo called, or gems of leſs value, as the common opal, the onyx, the chalcedony, the cornelian, and the coloured and colourleſs rock cryſtals, have been employed for ornaments and economical utenſils, in which the price of the workmanſhip greatly exceeds the intrinſic value of the ſtones. The ancients uſed to engrave concave and convex figures on them, which now-a-days are very highly valued, but often with leſs reaſon than modern performances of the ſame kind. Theſe ſtones are worked by means of emery on plates and tools of lead, copper, and tin, or with other inſtruments: but the common work on agates is performed at Oberſtein with grind-ſtones at a very cheap rate. When once ſuch a manufactory is eſtabliſhed in a country, it is neceſſary to keep it up with much induſtry and prudence, if we would wiſh it to ſurmount the caprice of faſhions; ſince, how muchſoever the natural beauties of theſe ſtones ſeem to plead for their pre-eminence, they will at ſome periods unavoidably ſink in the eſteem of mankind; but they will likewiſe often recover, and be reſtored to their former value.

The grindſtones at Oberſtein are of a red colour, and of ſuch particular texture, that they neither become ſmooth, nor are they of too looſe a compoſition.

Moſt part of the flinty tribe is employed for making glaſs, as the quartz, the flints, the pebbles, and the quartzoſe ſands. The quartz, however, is the beſt; and if uſed in due proportion with reſpect to the alkali, there is no danger of the glaſs being eaſily attacked by the acids, as has ſometimes happened with glaſs made of other ſubſtances, of which we had an inſtance of bottles filled with Rheniſh and Moſelle wines during the time of a voyage to China.

In the ſmelting of copper ores, quartz is uſed, to render the ſlag glaſſy, or to vitrify the iron; quartz being more uſeful than any other ſtone to prevent the calcination of the metal.

The quartzoſe ſand which conſtitutes part of many ſtones, and is alſo uſed in making crucibles and ſuch veſſels contributes moſt of all to their power of reſiſting fire.

It appears likewiſe probable that the quartzoſe matter makes the grind and whetſtone fit for their intended purpoſes. (*Magellan.*)

Order V. *The* Argillaceous Earths.

The principal character whereby thoſe may be diſtinguiſhed from other earths is, that they harden in the fire, and are compounded of very minute particles, by which they acquire a dead or dull appearance when broken.

I. *Argilla aerata ; lac lunæ.*

This fanciful name was heretofore thought to denote a very fine ſpecies of calcareous earth ; but Mr Screber has lately ſhown, that the earth to which this name is given, is a very uncommon ſpecies of argill. It is generally found in ſmall cakes of the hardneſs of chalk ; and like that, it marks white. Its hardneſs is nearly as that of ſteatites, and it does not feel ſo fat as common clay does. Its ſpecific gravity is 1669 ; its colour ſnow white. When examined with a microſcope, it is found to conſiſt of ſmall tranſparent cryſtals ; and by his experiments it appears plainly to be an argill ſaturated with fixed air. It effervеſces with acids, and contains a very ſmall proportion of calcareous earth and ſometimes of gypſum, beſides ſome feeble traces of iron. It is found near Halles.

II. Porcelain clay ; *Terra porcellanea*, vulgo *Argylla apyra*, very refractory ; the *kaolin* of the Chineſe.

(1.) Pure.

A. Diffuſible in water.

1. Coherent and dry.

a. White.

2. Friable and lean.

a. White.

(2.) Mixed with phlogiſton.

A. Diffuſible in water.

a. White and fat pipe clay. *b.* Of a pearl colour. *c.* Bluiſh grey. *d.* Grey. *e.* Black. *f.* Violet.

Theſe contain a phlogiſton, which is diſcovered by expoſing them to quick and ſtrong fire, in which they become quite black interiorly, aſſuming the appearance of the common flints, not only in regard to colour, but alſo in regard to hardneſs: but if heated by degrees, they are firſt white, and afterwards of a pearl colour. The fatter they ſeem to be, which may be judged both by their feeling ſmooth and unctuous, and by their ſhining when ſcraped with the nail, they contain a larger quantity of the inflammable principle. It is difficult to determine, whether this ſtrongly inherent phlogiſton be the cauſe of the abovementioned pearl-colour, or prevents them from being burnt white in a ſtrong fire ; yet no heterogeneous ſubſtance can be extracted from them, except ſand, which may be ſeparated from ſome by means of water ; but which ſand does not form any of the conſtituent parts of the clays. If they be boiled in aqua regis in order to extract any iron, they are found to loſe their viſcoſity.

III. Stone-marrow ; *Lithomarga Kiſſekil* of the Tartars.

1. When dry, it is as fat and ſlippery as ſoap ; but,

2. Is not wholly diffuſible in water, in which it only falls to pieces, either in large bits, or reſembles a curd like maſs.

3. In the fire it eaſily melts to a white or reddiſh frothy ſlag, conſequently is of a larger volume than the clay was before being fuſed.

4. It breaks into irregular ſcaly pieces.

A. Of coarſe particles : Coarſe ſtone-marrow.

a. Grey,

b. Whitiſh yellow, from the Crim Tartary, where it is called *Kiſſekil*, and is ſaid to be uſed for waſhing inſtead of ſoap.

B. Of very fine particles ; fine ſtone-marrow.

a. Yellowiſh brown ; *Terra Lemnia.*—Is of a ſhining texture, falls to pieces in the water with a crackling noiſe ; it is more indurated than the preceding, but has otherwiſe the ſame qualities.

IV. Bole, (iron clay.)

This is a fine and denſe clay of various colours, containing a great quantity of iron, which makes it impoſſible to know the natural and ſpecifical qualities of the bone itſelf, by any eaſy method hitherto in uſe. It is not eaſily ſoftened in water, contrary to what the porcelain and the common clays are, (I. and VI.) ; but either falls to pieces in form of ſmall grains, or repels the water, and cannot be made ductile. In the fire it grows black, and is then attracted by the loadſtone.

A. Looſe and friable boles, or thoſe which fall to a powder in water.

a. Fleſh-coloured bole.

b. Red.

1. Fine ; *Bolus Armenus*

2. Coarſe ; *Bolus communis officinalis.*

3. Hard ; *Terra rubrica.*

c. Green ; *Terre verte.*

1. Fine.

2. Coarſe.

d. Bluiſh grey, is ductile as long as it is in the rock, but even then repels the water ; it contains 40 per cent. of iron ; which metal being melted out of it in a cloſe veſſel, the iron cryſtallizes on its ſurface.

e. Grey.

1. Cryſtallized in a ſpherical polygonal figure.

2. Of an undeterminate figure.

B. Indurated bole.

A. Of no viſible particles.

This occurs very often in form of ſlate, or layers, in the earth ; and then is made uſe of as an iron ore. However, it has uſually been conſidered more in regard to its texture than to its conſtituent parts ; and has been called *ſlate*, in common with ſeveral other earths which are found to have the ſame texture.

a. Reddiſh-brown ; in moſt collieries, between the ſeams of coal.

b. Grey.

B. Of ſcaly particles.—The *hornblende* of the Swedes.

It is diſtinguiſhed from the martial glimmer, or mica, by the ſcales being leſs ſhining, thicker, and rectangular.

a. Black.—This, when rubbed fine gives a green powder.

b. Greeniſh.

V. Zeolyte.

This is deſcribed in its indurated ſtate in the Tranſactions of the academy of ſciences at Stockholm for the year 1756, and there arranged as a ſtone *ſui generis* in regard to the following qualities.

1. It is a little harder than the fluors and the other calcareous ſpars; it receives, however, ſcratches from the ſteel, but does not ſtrike fire with it.

2. It melts eaſily by itſelf in the fire, with a like ebullition as borax does, into a white frothy ſlag, which cannot without great difficulty be brought to a ſolidity and tranſparency.

3. It is more eaſily diſſolved in the fire by the mineral alkali *(ſal ſodæ)*, than by borax or the microcoſmic ſalt.

4. It does not ferment with this laſt ſalt, as lime does; nor with the borax, as thoſe of the gypſeous kind,

5. It diſſolves very ſlowly, and without any efferveſcence, in acids, as in oil of vitriol and ſpirit of nitre. If concentrated oil of vitriol be poured on pounded zeolites, a heat ariſes, and the powder unites into a maſs.

6. In the very moment of fuſion it gives a phoſphoric light.

There have lately been diſcovered ſome of the zeolites, particularly at Adelfors's gold mines in Smoland, in Sweden; of which ſome ſorts do not melt by themſelves in the fire, but diſſolve readily in the acid of nitre, and are turned by it into a firm jelly.

The zeolyte is found in an indurated ſtate:

(1.) Solid, or of no viſible particles.

A. Pure.

a. White.

B. Mixed with ſilver and iron.

a. Blue, *Lapis lazuli*.

(2.) Sparry zeolite. This reſembles a calcareous ſpar, though it is of a more irregular figure, and is more brittle.

a. Light red, or orange-coloured.

(3.) Cryſtalliſed zeolite. This is more common than the two preceding kinds; and is found,

A. In groupes of cryſtals, in form of balls, and with concentrical points.

a. Yellow,

b. White.

B. Priſmatical and truncated cryſtals.

a. White.

C. Capillary cryſtals, which are partly united in groupes, and partly ſeparate. In this latter accretion they reſemble the capillary or feathery ſilver ore: and are perhaps ſometimes called *flos ferri*, at places where the nature of that kind of ſtone is not yet fully known.

a. White.

VI. Tripoli.

This is known by its quality of rubbing or wearing hard bodies, and making their ſurfaces to ſhine; the particles of the tripoli being ſo fine as to leave even no ſcratches on the ſurface. This effect, which is called *poliſhing*, may likewiſe be effected by other fine clays when they have been burnt a little. The tripoli grows ſomewhat harder in the fire, and is very refractory: it is with difficulty diſſolved by borax, and ſtill with greater difficulty by the microcoſmic ſalt. It becomes white when it is heated: when crude, it imbibes water, but is not diffuſible in it: it taſtes like common chalk, and is rough and ſandy between the teeth, although no ſand can by any means be ſeparated from it. It has no quality common with any other kind of earth, by which it might be conſidered as a variety of any other. That which is here deſcribed is of a yellow colour, and is ſold by druggiſts. This kind of tripoli has been lately diſcovered in Scotland. But the *rotten-ſtone*, ſo called, is another ſort found in England, viz. in Derbyſhire. It is in common uſe in England among workmen for all ſorts of finer grinding and poliſhing, and is alſo ſometimes uſed by lapidaries for cutting of ſtones, &c.

The tripoli is found,

1. Solid: of a rough texture.

a. Brown.

b. Yellowiſh.

c. Spotted like marble.

2. Friable and compact.

a. Granulated.

b. Brown.

c. Yellowiſh.

VII. Common clay, or brick clay.

This kind may be diſtinguiſhed from the other clays by the following qualities:

1. In the fire it acquires a red colour, more or leſs deep.

2. It melts pretty eaſily into a greeniſh glaſs.

3. It contains a ſmall quantity of iron and of the vitriolic acid, by which the preceding effects are produced.

It is found,

A. Diffuſible in water.

1. Pure.

a. Red clay.

b. Fleſh-coloured, or pale-red.

c. Grey.

d. Blue.

e. White.

f. Fermenting clay.

2 Mixed with lime. See Marle, above,

B. Indurated.

1. Pure.

a. Grey ſlate.

b. Red ſlaty.

2. Mixed with phlogiſton, and a great deal of the vitriolic acid. See *Alum Ores*, above.

3. Mixed with lime. See Lime, above.

VIII. Argillaceous fiſſile ſtones.

Theſe and many other different kinds of earth have been comprehended under the denomination of *ſchiſti*; but to avoid ambiguity we will confine this name to ſtones of the argillaceous kind.

1. The bluiſh purple ſchiſtus, or common roof ſlate; *ſchiſtus tegularis*.
   Its colour varies to the pale, to the ſlightly purple, and to the bluiſh.
   a. The dark-blue ſlate, *ſchiſtus ſcriptorius*.
2. The pyritaceous ſchiſtus.
   This is of a grey colour, brown, blue, or black.
3. The bituminous ſchiſtus.
   This is generally black, of a lamellar texture, and of different degrees of hardneſs.
4. Flag ſtone.
   This is of a grey, yellowiſh, or reddiſh white colour.
5. The argillaceous grit.
   This is called alſo *ſand ſtone* and *free ſtone*, becauſe it may be cut eaſily in all directions.
6. *Killas*.
   This ſtone is of a pale grey or greeniſh colour; either lamellar, or coarſely granular. It is found chiefly in Cornwall.
7. *Toadſtone*.
   Dr Withering, who has given an analyſis of this ſtone, deſcribes it as being of a dark browniſh grey colour, of a granular texture, not giving fire with ſteel, nor effervesſcing with acids. It has cavities filled with cryſtalliſed ſpar, and is fuſible *per ſe* in a ſtrong heat. It is found in Derbyſhire. See Toadstone.

For the œconomical uſes of the argillaceous earths, ſee the article Clay.

[The compounds of this and other earths will fall to be mentioned under a ſubſequent diviſion.]

Class II. SALTS.

By this name thoſe mineral bodies are called which can be diſſolved in water; and give it a taſte; and which have the power, at leaſt when they are mixed with one another, to form new bodies of a ſolid and angular ſhape, when the water in which they are diſſolved is diminiſhed to a leſs quantity than is required to keep them in ſolution; which quality is called *cryſtalliſation*.

In regard to the principal known circumſtances or qualities of the mineral- ſalts, they are divided into

1. Acid ſalts, or mineral acids.
2. Alkaline ſalts, or mineral alkalies.

Order I. Acid Salts.

For the characters, properties, and phenomena of theſe, ſee the article Acid, and Chemistry-*Index*.

Till of late no more mineral acids were known than the vitriolic and marine; the boracic or ſedative ſalt being reckoned as produced artificially: but later diſcoveries have proved that we may reckon at leaſt *eleven mineral acids*; out of which only two or three have been found in an uncombined ſtate. Thoſe hitherto known are the following, viz. the *vitriolic*, the *nitrous*, the *marine*, the *ſparry*, the *arſenical*, the *molybdenic*, the *tungſtenic*, the *phoſphoric*, the *boracic*, the *ſuccinous*, and the *aerial*. See the article Acid, and Chemistry-*Index*.

I. The vitriolic acid. See Chemistry-*Index*.

II. Nitrous acid.

This acid is by ſome excluded from the mineral kingdom, becauſe they ſuppoſe it to be produced from putrefaction of organic bodies. But theſe bodies, when deprived of life, are again received amongſt foſſils, from whence their more fixed parts were originally derived. For the nature of this acid, See Chemistry-*Index*.

III. Acid of common or ſea-ſalt. See Chemistry-*Index*, at *Acid* and *Marine*.

IV. The *fluor* acid, or ſparry fluor acid. See Chemistry-*Index*.

This acid is obtained by art, as it has never been found diſengaged, but united to calcareous earth, forming a ſparry fluor *, called *Derbyſhire fluor*, *Corniſh fluor*, *blue John*, or *amethyſt root*, when of a purple colour. See p. 72. col. 2. concerning the ſubſtances ariſing from the combination of this acid with calcareous earth.

* See Fluor Spar.

V. The acid of *arſenic*. See Chemistry-*Index*.

VI. The acid of *molybdena*. *Ibid.*

VII. The acid of *tungſten*. *Ibid.*

VIII. The *phoſphoric* acid. *Ibid.*

IX. The *boracic* acid. *Ibid.*

X. The ſuccinous or *amber* acid. *Ibid.*

XI. Aerial acid, or *fixed air*. *Ibid.*

Order II. Alkaline Mineral Salts.

For the characters, properties, and phenomena of theſe, ſee the article Alkali; alſo Chemisrty-*Index*, at *Alkaly Alkalies*.

New acids are daily detected: but no additions have been made to the three ſpecies of alkali long ſince known.

Theſe alkali ſalts are,

I. Vegetable fixed alkali (A.)

(A) With regard to the origin of the vegetable fixed alkali, there are ſufficient proofs that it exiſts already formed in plants, and alſo that a portion is formed by combuſtion: but in each caſe, the alkali is obtained in an impure ſtate, through the admixture of other matters, which muſt be ſeparated before it can be uſed for chemical purpoſes.

The *cendres gravelées* are made by burning the huſks of grapes and wine lees. They contain the pureſt alkali met with in common, and are uſed by the dyers.

Pot-aſh is made by burning wood and other vegetables. This alkali is much phlogiſticated, and contains many foreign and ſaline matters, which, however, may be ſeparated.

That which is obtained from the aſhes of wood burned in kitchens is the moſt pure of all. On the con-

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Vegetable fixed alkali, deprived of every acid, is not found any where by itſelf; but it is ſometimes met with in combination with the vitriolic acid or the muriatic, generally with the nitrous, rarely with the aerial (B.)

The fixed vegetable alkali (or *potaſſe* of Morveau), is of a powdery appearance, and of a dead white colour. When pure, it is much more cauſtic than the neutral ſalt; it forms with the aerial acid, and even corrodes the ſkin (C.)

1. It changes the blue colours of vegetables into a deep green.
2. It has no ſmell when dry; but when wetted, it has a ſlight lixivious odour.
3. Its taſte is ſtrongly acrid, burning, cauſtic, and urinous (D). This laſt ſenſation ariſes from the volatile alkali it diſengages from animal ſubſtances.
4. When expoſed to the air, it attracts humidity, and is reduced into a tranſparent colourleſs liquor. According to Gellert, it attracts three times its own weight of water.
5. It likewiſe attracts ſometimes the aerial acid from the atmoſphere, and is thereby deprived of its property of deliqueſcing.
6. When it is diſſolved in an equal weight of water, it has an oily feel, owing to its action on the fatty parts of the ſkin, whence it is, though improperly, called *oil of tartar*.
7. In a moderate heat it melts; but in a more violent fire, it is diſperſed or volatiliſed.
8. It is a moſt powerful ſolvent by the dry way: in a proper heat, it diſſolves calcareous, argillaceous, ſiliceous, and metallic earths: and when the alkali is nearly equal in quantity to the earth, it forms various kinds of hard, ſolid, and tranſparent glaſs.
9. But if the alkali be in quantity three or four times that of the earth, the glaſs is deliqueſcent.
10. The mild vegetable alkali unites with the vitriolic acid with a violent effervescence, and produces vitriolated tartar.

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11 With the nitrous acid, it forms the cryſtalliſable ſalt, called *nitre*.
12. With the marine acid it forms a kind of ſalt leſs grateful than common ſalt, which is called the *febrifuge ſalt of ſylvius*.
13. With vinegar it forms a neutral deliqueſcent ſalt of a ſharp taſte, called *terra foliata tartari*.
14. With cream of tartar it forms tartarized tartar.
15. It diſſolves ſulphur, and forms the ſubſtance called *liver of ſulphur*, which is a powerful ſolvent of metallic ſubſtances.
16. It attracts the metals, and diſſolves ſome of them with peculiar management. Silver, mercury, and lead, are more difficultly diſſolved than gold, platina, tin, copper, and eſpecially iron. The laſt gives a fine reddiſh ſaffron colour, firſt obſerved by Stahl, who called it the *martial alkaline tincture*.
17. It diſſolves in the dry way all the dephlogiſticated metallic calces.
18. It unites with oils and other fat ſubſtances, with which it forms ſoap.
19. This alkali becomes opaque when expoſed to the flame of the blow-pipe: it decrepitates a long time, and forms a glaſſy button, which is permanent in the little ſpoon; but is abſorbed with ſome noiſe on the charcoal when blown upon it.

II. Foſſile fixed alkalis.

A. Alkali of the ſea, or of common ſalt (E.)

1. Pure.

This has nearly the ſame qualities with the lixivious ſalt, which is prepared from the aſhes of burnt vegetables. It is the ſame with the *ſal ſodæ*, or kelp: for the kelp is nothing elſe than the aſhes remaining, after the burning of certain herbs that abound in common ſalt; but which common ſalt, during the burning of thoſe vegetables, has loſt its acid (F).

The properties of the foſſile alkali are as follows:

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trary, that which is got from tartar, properly burned, then diſſolved in boiling water, and purified by filtration and cryſtalliſation, is called *ſalt of water*. It is the beſt.

(B) The vegetable alkali is ſeldom found in the earth, except in wells of towns, as at Doway, or in the argillaceous alum-ore of la Tolfa: it is found alſo united to the nitrous acid, near the ſurface of the earth, in Spain, and in the Eaſt-Indies, probably from the putrefaction of vegetables.

(C) Common vegetable alkali, ſalt of tartar, and pot-aſh, were formerly conſidered by chemiſts as ſimple alkalis; but Dr Black has demonſtrated them to be true neutral ſalts, ariſing from the combination of the vegetable alkali with the aerial acid. From hence it follows, that the above common alkalies, even after any other extraneous ſubſtance has been extracted, muſt be freed from this acid, by putting each in a crucible, and expoſing it to a ſtrong fire, which will diſſipate this aerial acid. The alkali ſo purified, is to be put in a glaſs vial before it be entirely cold, and kept cloſe with a proper ſtopple; otherwiſe the aerial acid which floats in large quantities on the atmoſphere will combine again with the pure alkali. (*Mongez.*)

(D) The alkali muſt be largely diluted with water, in order to be taſted; otherwiſe it will act on the tongue, and corrode the parts where it touches. (*Macquer.*)

(E) This ſalt is not met with pure in Europe; but it is ſaid to be found in both the Indies, not only in great quantity, but likewiſe of a tolerable purity: it is there collected in form of an efflorefcence in the extenſive deſerts, a profitable trade being carried on in it for the making of ſoap and glaſs; and, therefore, it is very probable that the ancients meant this ſalt by the *natron* or *baurach*. (*Magellan.*)

(F) The mineral alkali is often combined with the vitriolic and marine acid, alſo with the aerial acid;

1. It efferveſces with acids, and unites with them.
2. Turns the ſyrup of violets to a green colour.
3. Precipitates ſublimate mercury in an orange-coloured powder.
4. Unites with fat ſubſtances, and forms ſoap.
5. Diſſolves the ſiliceous earth in the fire, and makes glaſs with it, &c. It diſtinguiſhes itſelf from the ſalt of the pot-aſhes by the following properties (G).
6. It ſhoots eaſily into rhomboidal cryſtals; which
7. Fall to powder in the air, merely by the loſs of their humidity (H).
8. Mixed with the vitriolic acid, it makes the *ſal mirabile Glauberi*.
9. It melts more eaſily, and is fitter for producing the *ſal commune regeneratum, nitrum cubicum* &c. Perhaps it is alſo more conveniently applied in the preparation of ſeveral medicines.
10. It is ſomewhat volatile in the fire.

III. Volatile mineral alkali.

This perfectly reſembles that ſalt which is extracted from animals and vegetables, under the name of *alkali volatile* or *ſal urinoſum*, and is commonly conſidered as not belonging to the mineral kingdom; but ſince it is diſcovered, not only in moſt part of the clays, but likewiſe in the ſublimations at Solfatara, near Naples, it cannot poſſibly be quite excluded from the mineral kingdom (I).

Its principal qualities are,

a. In the fire it riſes in *forma ſicca*, and volatiliſes in the air in form of corroſive vapours, which are offenſive to the eyes and noſe (K).

b. It precipitates the ſolution of the mercurial ſublimate in a white-powder.

c. It alſo precipitates gold out of aqua-regia, and detonates with it; becauſe,

d. It has a re-action in regard to the acids, tho' not ſo ſtrongly as other alkalies.

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acid; with which laſt it retains not only the name but many of the properties of a pure alkali, becauſe this laſt acid is eaſily expelled.

It is eaſily known by its cryſtalliſation and its ſolubility in two times and an half of its weight of water, at the temperature of 60 degrees.

One hundred parts of this alkali, when pure and recently cryſtalliſed, contain 20 of mere alkali, 16 of aerial acid, and 64 of water. *(Macquer.)*

Mineral alkali is found in Hungary, in marſhy grounds, of an argillaceous or marly nature, either mixed with water or cryſtalliſed and effloreſcing. It is found alſo in Egypt at the bottom of lakes, and dried up by the ſummer's heat; and alſo in the province of Suchena, 28 days journey from Tripoli, where it has the name of *Trona;* in Syria, Perſia, as well as in the Eaſt-Indies, and China, where it is called *kien*. It ſometimes germinates on walls, and is called by many *aphronitron*. In its native ſtate, it is frequently mixed with magneſian earth, common ſalt, muriatic magneſia, and marine ſelenite. *(Kirwan.)*

(G) This mineral alkali likewiſe differs from the vegetable, 1. By its taſte, which is leſs corroſive and burning. 2. By its not deliqueſcing. 3. By the ſmall degree of heat it produces if calcined, and afterwards added to water. 4. By its property of cryſtalliſing, by evaporating the water from its ſolution, as is practiſed with neutral ſalts; whereas the vegetable alkali does not cryſtalliſe unleſs combined with a large portion of aerial acid.

(H) This alkali being a very uſeful commodity, and eſſentially neceſſary in a number of manufactories, many ingenious proceſſes have been contrived and attempted to procure it at a cheap rate, by decompoſing the ſea-ſalt; but it is believed, that till lately none of theſe new manufactures have ſucceeded, except that of Mr Turner, mentioned by Mr Kirwan in the ſecond part of the Philoſophical Tranſactions for 1782.—The proceſs is ſaid to conſiſt in mixing a quantity of litharge with half its weight of common ſalt, which, on being triturated with water till it aſſumes a white colour, is left to ſtand ſome hours; after which, a decompoſition enſues, the alkali being left alone, whilſt the acid unites to the metallic calx; and this laſt being urged by a proper degree of fire, produces a fine pigment of a greeniſh yellow colour, whoſe ſale pays for the moſt part of the expences.

Mr Kirwan ſays, in the place already quoted, that if common ſalt perfectly dry be projected on lead heated to incandeſcence, the common ſalt will be decompoſed, and a horn-lead formed, according to Margraaf. He adds alſo, that according to Scheele, if a ſolution of common ſalt be digeſted with litharge, the common ſalt, will be decompoſed, and a cauſtic alkali produced; and finally, that Mr Scheele decompoſed common ſalt by letting its ſolution ſlowly paſs through a funnel filled with litharge.

(I) It is eaſily known, by its ſmell, though in a mild ſtate, by its volatility, and by its action on copper; the ſolutions of which, in the mineral acids, are turned blue by an addition of this alkali. It is frequently found, though in ſmall quantities, in mould, marle, clay, ſchiſtus, and in ſome mineral waters. It probably derives its origin in the mineral kingdom, from the putrefaction or combuſtion of animal or vegetable ſubſtances. *(Kirwan.)*

The ſame is cauſtic when uncombined with any acid, not excepting even the aerial acid. It differs from the other two alkalies in many eſſential particulars. 1. By its aeriform or gaſeous nature. For the volatile alkali, in a ſtate of purity, is nothing more than an alkaline gas diffuſed in water, as Dr Prieſtley has demonſtrated. 2. By its volatility. 3. By the nature of the ſalts it forms with acids, which are very different from thoſe whoſe baſes are formed either of the vegetable or mineral alkali. *(Mongez.)*

(K) Pure volatile alkali, in an aerial form, reſembles atmoſpheric air, but is more heavy. Its ſmell is pene-

e. It tinges the ſolution of copper blue, and diſſolves this metal afreſh if a great quantity is added (L).

f. It deflagrates with nitre, which proves that it contains a phlogiſton.

It is never found pure.

Order III. Neutral Salts.

Acids united to alkalies form neutral ſalts. Theſe diſſolved in water are no ways diſturbed by the addition of an alkali; and generally, by evaporation, concrete into cryſtals. If, by proper teſts, they ſhow neither acid nor alkaline properties, they are ſaid to be *perfect* neutrals; but *imperfect*, when, from defect in quantity or ſtrength of one ingredient, the peculiar properties of the other more or leſs prevail.

I. Vitriolated tartar, vitriolated vegetable alkali, or (as Morveau calls it) the *vitriol of pot-aſh*.

This is a perfectly neutral ſalt, which reſults from the combination of the vitriolic acid with the vegetable fixed alkali. According to Bergman, it ſeldom occurs ſpontaneouſly in nature, unleſs where tracks of wood have been burnt down: and Mr Bowles, quoted by Mr Kirwan, ſays it is contained in ſome earths in Spain. See Chemistry-*Index*.

It is eaſily obtained, by pouring the vitriolic acid on a ſolution of fixed vegetable alkali till it is ſaturated. Cryſtals of this neutral ſalt are then formed. This cryſtalliſation ſucceeds better by evaporation than by cooling, according to Mongez.

The taſte of this ſalt is diſagreeable, though ſomewhat reſembling common ſalt.

II. Common nitre, *(Alkali vegetabile nitratum)*.

This is known in commerce by the name of *ſalt-petre*, and is alſo called *priſmatic nitre*, to diſtinguiſh it from the cubic nitre after-mentioned.—It is perfect neutral ſalt; reſulting from the combination of the nitrous acid with the pure vegetable alkali.

According to Bergman, it is formed upon the ſurface of the earth, where vegetables, eſpecially when mixed with animal-ſubſtances, putrify.—See Chemistry-*Index*, at *Nitre*.

III. Digeſtive ſalt, ſalt of Sylvius, *(Alkali vegetabile ſalitum)*.

This neutral ſalt is ſometimes, though rarely, met with on the earth, generated perhaps, as profeſſor Bergman obſerves, by the deſtruction of animal and vegetable ſubſtances.

According to Macquer, this ſalt has been very wrongly called *regenerated marine ſalt*; and the epithet of *febrifuge* has alſo been given to it, without any good reaſon, to evince that it has ſuch a property. But M. de Morveau calls it *muriate de potaſſe* with great propriety.

This ſalt is produced by a perfect combination of the vegetable alkali with marine acid. It has been wrongly confounded with common ſalt.—It is found in ſome bogs in Picardy, and in ſome mineral waters at Normandy, according to Monet, quoted by Kirwan. Mongez adds alſo the ſea-water, as containing this ſalt, and that it is never found in large quantities, although its component parts are abundantly produced by nature. See Chemistry-*Index*, at *Digeſtive*.

IV. Mild vegetable alkali, *(alkali vegetabile aeratum.)*

This ſalt was formerly conſidered as a pure alkali, known by the name of *potaſh* and *ſalt of tartar*: but ſince the diſcovery of the aerial acid, it is very properly claſſed among the neutral ſalts, and ought to be called *aerated potaſſe*.

It reſults from a combination of the vegetable alkali with the aerial acid, and is hardly ever found native, unleſs in the neighbourhood of woods deſtroyed by fire.

On being expoſed on a piece of charcoal, urged by the blow-pipe, it melts, and is abſorbed by the coal; but,

In the metallic ſpoon, it forms a glaſſy bead, which becomes opaque when cold.

V. Vitriolated acid ſaturated with mineral alkali; Glauber's ſalt. *Alkali minerale vitriolatum.*

This is a neutral ſalt, prepared by nature (as well as by art), containing more or leſs of iron, or of a calcareous earth; from which ariſes alſo ſome difference in in its effects when internally uſed. It ſhoots eaſily into priſmatical cryſtals, which become larger in proportion to the quantity of water evaporated before the cryſtalliſation. When laid on a piece of burning charcoal, or elſe burnt with a phlogiſton, the vitriolic acid diſcovers itſelf by the ſmell reſembling the hepar ſulphuris.

It is found in a diſſolved ſtate in ſprings and wells. Some of the lakes in Siberia and Aſtracan,

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pentetrating, and ſuffocates animals. Its taſte is acrid and cauſtic. It quickly converts blue vegetable colours to green, and produces heat during its combination with water. But if the water be frozen, it melts, producing at the ſame time an extreme degree of cold. It has a remarkable action on moſt metals, particularly copper.

This ſubſtance is obtained by the putrefactive fermentation from animal and ſome vegetable matters. It is this ſalt which cauſes that ſtrong ſmell which is perceived in drains and privies on a change of weather. (*Mongez*).

Its volatility ariſes from a very ſubtile and volatile (or phlogiſtic) oil, which enters as a principle into its compoſition. (*Macquer*).

(L) The ſolution of copper by this alkali, which is of a fine blue, preſents a remarkable phenomenon. For if it be kept in a well cloſed phial, the colour decays, and at length diſappears, giving place to tranſparency. But on opening the phial, the ſurface or part in contact with the air becomes blue, and the colour is communicated through the whole maſs. This experiment may be many times repeated with the ſame ſucceſs.

can, and many ſprings in other places, contain this ſalt, according to Bergman. It is found in the ſea-water; alſo in the earth, at ſeveral parts of Dauphiné in France, and in Lorraine; and ſometimes it germinates on the ſurface of the earth, according to Monet, quoted by Kirwan. It is found, in a dry form, on walls, in ſuch places where aphronitrum has effloreſced through them, and the vitriolic acid has happened to be preſent; for inſtance, where marcaſites are roaſted in the open air. This ſalt is often confounded with the aphronitrum or mild mineral alkali.

VI. Cubic or quadrangular nitre. *Alkali minerale nitratum.*

This is the neutral ſalt which reſults from the combination of mineral alkali with nitrous acid. It has almoſt all the characters of priſmatic or common nitre, from which it only differs on account of its baſe; and takes its denomination from the figure of its cryſtals, which appear cubic.

This ſalt rarely occurs but where marine plants putrify. According to Bowles, quoted by Kirwan, it is found native in Spain. See CHEMISTRY, n° 741, &c.

VII. Common ſalt, or ſea-ſalt; *Alkali minerale ſalitum, ſal commune.*

This ſalt ſhoots into cubical cryſtals during the very evaporation; crackles in the fire, and attracts the humidity of the air. It is a perfectly neutral ſalt, compoſed of marine acid, ſaturated with mineral alkali. It has a ſaline but agreeable flavour. See CHEMISTRY-*Index*, at *Sea-ſalt.*

A. Rock ſalt, foſſile ſalt; *Sal montanum.* Occurs in the form of ſolid ſtrata in the earth.

1. With ſcaly and irregular particles.
   a. Grey, and
   b. White. Theſe are the moſt common, but the following are ſcarcer:
   c. Red;
   d. Blue; and
   e. Yellow, from Cracow in Poland, England, Salzberg, and Tirol.
2. Cryſtallized rock ſalt; *ſal gemmæ.*
   a. Tranſparent, from Cracow in Poland, and from Tranſylvania.

B. Sea-ſalt.

This is produced alſo from ſea-water, or from the water of ſalt lakes by evaporation in the ſun, or by boiling.

The ſeas contain this ſalt, though more or leſs in different parts. In Siberia and Tartary there are lakes that contain great quantities of it.

C. Spring ſea-ſalt.

This is produced by boiling the water of the fountains near Halle in Germany, and other places.

Near the city of Lidkoping, in the province of Weſtergotland, and in the province of Dal, ſalt-ſprings are found, but they contain very little ſalt: and ſuch weak water is called *ſolen* by the Swedes.

VIII. Borax.

This is a peculiar alkaline ſalt, which is ſuppoſed to belong to the mineral kingdom, and cannot be otherwiſe deſcribed, than that it is . . . . . . diſſoluble in water, and vitreſcible; . . . . . . that it is fixed in the fire; and melts to a glaſs; which glaſs is afterwards diſſoluble in water. See the detached article BORAX.

IX. Mild mineral alkali; *Alkali minerale aeratum.* Natron, the nitre of the ancients.

This neutral ſalt is a combination of the mineral alkali with the aerial acid or fixed air. It is found plentifully in many places, particularly in Africa and Aſia, either concreted into cryſtallized ſtrata, or fallen to a powder; or efflореſcing on old brick walls; or laſtly, diſſolved in ſprings. It frequently originates from decompoſed common ſalt.

This is an imperfect neutral ſalt, and was formerly conſidered as a pure alkali; but the diſcovery of the aerial acid has ſhown the miſtake.

1. It has nearly all the properties of the *pure* mineral *alkali* N° II. *A.* 1. (p. 90.), but with leſs energy.
2. The vegetable blue colours are turned green by this ſalt; it effloreſces with acids, and has an urinous taſte.
3. It is ſoluble in twice its weight of cold water; but if the water is hot, an equal weight is ſufficient for its ſolution.
4. It effloreſces when expoſed to the action of the atmoſphere.
5. It fuſes eaſily on the fire, but without being decompoſed.
6. Facilitates the fuſion of vitrifiable earths, and produces glaſs more or leſs fine according to their qualities.
7. It is decompoſable by lime and ponderous earth, which attract the aerial acid.
8. And alſo by the mineral acids, but theſe expel the aerial acid of this ſalt, by ſeizing its alkaline baſis. (*Monges.*)

Wallerius confounds this ſalt with the *aphronitrum* after-mentioned, and calls it *ſal nitrum*, when it contains ſome phlogiſton. Mr Kulbel, quoted by Wallerius, ſhowed that it exiſts in ſome vegetable earths, and takes it to be the cauſe of their fertility; but this (M. Magellan obſerves) can only be on account of its combination with the oily parts of them, and forming a kind of ſoap, which is miſcible with the watery juices.

X. Vitriolic ammoniac, (*Alkali volatile vitriolatum.*)

This neutral ſalt was called *ſecret ſalt of Glauber*, and is a combination of the volatile alkali with vitriolic acid. According to Bergman, it is ſcarcely found any where but in places where the phlogiſticated fumes of vitriolic acid ariſe from burning ſulphur, and are abſorbed in putrid places by the volatile alkali. Thus at Fahlun the acid vapour from the roaſted minerals produces this ſalt in the neceſſary-houſes. Dr Withering, however, obſerves, that as volatile alkali may be obtained in large quantities from pit-coal, and produced by proceſſes not dependent upon putrefaction, there is reaſon to believe that the vitriolic ammoniac may be formed in ſeveral ways not noticed by the above author.

Neutral Salts.

It is ſaid to have been found in the neighbourhood of volcanoes, particularly of Mount Veſuvius, where, indeed, it might well be expected; yet its exiſtence ſeems dubious, ſince Mr Bergman could ſcarce find any trace of it among the various ſpecimens of ſalts from Veſuvius which he examined. The reaſon (according to M. Magellan) probably is, that the vitriolic acid diſengaged by the combuſtion of ſulphur is in a phlogiſticated ſtate; and all its combinations in this ſtate are eaſily decompoſed by the marine acid, which plentifully occurs in volcanoes. It is alſo ſaid to be found in the mineral lakes of Tuſcany, which is much more probable, as the vitriolic acid when united to water eaſily parts with phlogiſton, and recovers its ſuperiority over other acids. It is ſaid likewiſe that this neutral ſalt is found on the ſurface of the earth in the neighbourhood of Turin.

1. This ſalt is of a friable texture, and has an acrid and urinous taſte.
2. Attracts the moiſture of the atmoſphere.
3. Is very ſoluble in water, it requiring only twice its weight of cold water, or an equal weight of boiling water, to be diſſolved.
4. It becomes liquid on a moderate fire; but if urged,
5. It becomes red hot, and volatilizes.
6. The nitrous and muriatic acid decompoſe this ſalt by ſeizing the volatile alkali. But
7. Lime, ponderous earth, and pure fixed alkali, ſet the volatile alkali free, and combine with the vitriolic acid.
8. According to Kirwan, 100 parts of this ſalt contain about 42 of real vitriolic acid, 40 of volatile alkali, and 18 of water.

This vitriolic ammoniac is eaſily known; for if quicklime or fixed alkali be thrown into its ſolution, the ſmell of the volatile alkali is perceived; and if this ſolution be poured into that of chalk or ponderous earth by the nitrous acid, a precipitate will appear.

XI Nitrous ammoniac, *(Alkali volatile nitratum.)*

This is a neutral ſalt, which reſults from the combination of the nitrous acid with the volatile alkali. It is frequently found in the mother-liquor of nitre. When mixed with a fixed alkali, the volatile betrays itſelf by its ſmell.

1. It is of a friable texture, of a ſharp bitter, and of a nitrous or cooling taſte.
2. According to Mongez, it attracts the moiſture of the atmoſphere; but Romé de l'Iſle aſſerts, that its cryſtals are not deliqueſcent: the experiment may be eaſily tried, and the truth aſcertained.
3. It is ſoluble in cold water; but half the quantity of water, if boiling, is ſufficient for diſſolving it.
4. It liquefies on the fire, and afterwards it becomes dry.
5. It detonates with a yellow flame before it is red hot; and what is peculiar to this ſalt, it needs not, like common nitre, the contact of any combuſtible matter for its detonation; from whence it appears that the volatile alkali itſelf poſſeſſes a great ſhare of phlogiſton.
6. Its component parts, viz. the nitrous acid and the volatile alkali, are not very intimately united; and of courſe,
7. It is eaſily decompoſed by all the ſubſtances that have any affinity to either of them.
8. Mixed with the muriatic acid it makes aqua regia.
9. One hundred parts of this neutral ſalt contain 46 of nitrous acid, 40 of volatile alkali, and 14 of water, as Mr Kirwan thinks.

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XII. Native ſal ammoniac. The muriatic (or marine) acid ſaturated with a volatile alkali.

This is of a yellowiſh colour, and is ſublimed from the flaming crevices, or fire-ſprings, at Solfatara, near Naples.

XIII. Aerated or mild volatile alkali.

This neutral ſalt reſults from the combination of volatile alkali united to the aerial acid. It was formerly conſidered as a pure alkali:—But the diſcovery of the aerial acid (or fixed air) has ſhown it to be a true neutral ſalt, though imperfect; as it retains ſtill all the properties of an alkali, though in a weaker degree, on account of its combination with the aerial acid, which is itſelf the moſt weak of all acids, and of courſe other ſtronger acids eaſily diſlodge it from its baſe, and from various ammonial ſalts.

1. This imperfect neutral ſalt has an urinous taſte, and a particular ſmell, which is very penetrating, though leſs pungent, than the pure volatile alkali; and in the ſame manner it turns the blue vegetable juices green. But,
2. It efferveſces with other acids ſtronger than the aerial one, which the pure or cauſtic volatile alkali does not.
3. It ſublimes very eaſily with a ſmall degree of heat;
4. And diſſolves in twice its weight of cold water; but in a leſſer quantity, when this laſt is boiling hot.
5. It acts on metallic ſubſtances, chiefly on copper, with which a blue colour is produced.

According to Bergman, this ſalt was found in a well in London (Phil. Tranſ. for 1767), at Frankfort on the Main, and at Lauchſtadt.—Meſſrs. Hierne, Henkel, and Brandt, have found alſo this ſalt in the vegetable earth, in various kinds of argil, and in ſome ſtony ſubſtances. Mr Vozel found it alſo in ſome of the incruſtations at Gottingen; and Mr Malouin in ſome acidulous waters in France.

M. Magellan obſerves, that the borax and the three aerated alkalis are called *imperfect* neutrals; whilſt the other neutral ſalts have acquired the name of *perfect*, becauſe theſe laſt do not exhibit any of the diſtinguiſhing properties of their component parts. The three aerated alkalis have a very diſtinct alkaline character, as they turn blue vegetable juices green, though not of ſo vivid a colour as the cauſtic alkali does; and the borax is capable of receiving almoſt an equal quantity of its ſedative acid, without loſſing all its alkaline properties.

In general, thoſe neutral ſalts, conſiſting of fixed alkalies combined with acids, are more ſaturated than thoſe compoſed of volatile alkali called ammoniacal ſalts, or thoſe called aerated; which laſt are only compoſed by the combination of the aerial acid, united to any alkaline or earthy baſe.

The aerated alkalis are called alſo by the name of *mild* alkalis, becauſe they poſſeſs no longer that ſharp corroding quality which they exhibit when deprived of the aerial acid or fixed air; in which caſe they are termed cauſtic alkalis.

Theſe aerated alkalis differ alſo from the cauſtic ones, not only on account of the mildneſs of their taſte, from which comes their epithet of mild alkalis, but alſo by their property of cryſtalliſing, and by their effervеſcing with other acids, which expel the aerial one, the weakeſt of all acids we know.

Order IV. Earthy *Neutral Salts*.

The compounds of earths and acids which poſſeſs ſolubility are decompoſed and precipitated by mild, but not by phlogiſticated alkalis.

I. Calcareous earth combined with vitriolic acid.—Vitriolated calx; Selenite; Gypſum. See p. 72. col. 1. *ſupra*.

The gypſum, or plaſter, is not only found diſſolved in various waters, but alſo in many places it forms immenſe ſtrata. It is placed by all mineralogiſts among the earths, which it greatly reſembles; but it rather belongs to the ſaline ſubſtances of the neutral kind, as appears by its conſtituent parts. When burnt, it generates heat with water, but in a leſs degree than lime does. Berg. Sciag. § 59.

This ſalt has a particular taſte, neither bitter nor aſtringent, but earthy, when applied to the tongue; and it is owing to it that ſome waters, chiefly from pumps and wells, are called hard waters, becauſe they lie heavy on the ſtomach.

It is unalterable whilſt kept in a dry place; but on being expoſed to a moiſt air, it is much altered, and ſuffers a kind of decompoſition.

When expoſed to fire ſo as to loſe the water of its cryſtalliſation, it aſſumes a dead white colour; and it is then what we call plaſter of Paris; but if the fire is too ſtrong, it melts and vitrifies, after loſing the vitriolic acid with which it is ſaturated. See Gypsum.

The moſt famous quarries of gypſum in Europe, are thoſe of Montmartre, near Paris. See *Journal de Phyſique*; 1780, vol. xvi. p. 289 and 1782, vol. xix. p. 173.

It is found alſo in the vegetable kingdom.—Mr Model found that the white ſpots in the root of rhubarb are a ſelenitical or gypſeous earth (*Journal de Phyſ.* vol. vi. p. 14.)

What is called foſſil flour (*farine foſſile* in French), generally found in the fiſſures of rock and gypſeous mountains, is very different from the agaricus mineralis p. 71. col. 1. and from the lac lunæ, p. 87. col. 1.; as it is a true gypſeous earth, already deſcribed p. 72. col. 1. which, according to Mongez, is of a white and ſhining colour, though ſometimes it aſſumes a reddiſh or bluiſh colour, on account of ſome martial mixture.

II. Nitre of lime, (*Calx nitrata*).

This earthy ſalt is ſometimes found in water, but very ſparingly. It is ſaid that the chalk hills in ſome parts of France become ſpontaneouſly impregnated with nitrous acid, which may be waſhed out, and after a certain time they will become impregnated with it again. It is a combination of the nitrous acid with calcareous earth. (*Berg. Sciagr.*)

1. It is deliqueſcent; and is ſoluble in twice its weight of cold water, or in an equal weight of boiling water.
2. Its taſte is bitter.
3. Is decompoſed by fixed alkalies, which form the cubic and the priſmatic nitres.
4. But cauſtic volatile alkali cannot decompoſe it.
5. It does not deflagrate in the fire; yet paper moiſtened with a ſaturated ſolution of it crackles in burning.
6. In a ſtrong heat it loſes its acid.
7. Its ſolution does not trouble that of ſilver in nitrous acid.
8. The vitriolic acid precipitates its baſis.
9. As does likewiſe the acid of ſugar.
10. One hundred parts of it contain, when well dried, about 33 of nitrous acid, 32 of calcareous earth, and 35 of water.

It exiſts in old mortar, and in the mother liquor of nitre; and alſo in the chalk rocks near Roche Guyon, in France. (*Kirwan.*)

III. Muriatic chalk, or fixed ſalt ammoniac. *Acidum ſalis communis terra calcarea ſaturatum.*

This ſomewhat deliqueſces, or attracts the humidity of the air. It is found in the ſea water.

It is with great impropriety that this ſalt has obtained the name of ammoniac, on account only of its being formed in the chemical laboratories during the decompoſition of the ammoniacal ſalt with lime, in the proceſs for making the cauſtic volatile alkali. In this caſe, the muriatic acid unites to the calcareous baſis, while this laſt gives its water to the volatile alkali; which, therefore, comes over in a fluid cauſtic ſtate: but if chalk is employed inſtead of lime, the volatile alkali receives the aerial acid inſtead of water, and comes over in a concrete form. In neither caſe, the new combination of calcareous earth with muriatic ſalt has any volatile alkali to deſerve the name of ammoniacal ſalt. (*Macquer.*)

1. This earthy ſalt has a ſaline and very diſagreeable bitter taſte. It is ſuppoſed to be the cauſe of that bitterneſs and nauſeous taſte of ſea-water.
2. It fuſes in the fire, and becomes phoſphoreſcent, after undergoing a ſtrong heat.
3. It becomes hard, ſo as to ſtrike fire with ſteel.
4. It is then the phoſphorus of Homberg.
5. It is decompoſable by ponderous earth and fixed alkalis.

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6. And alſo by the vitriolic or nitrous acid; which expel the muriatic acid, to unite with the calcareous baſis. *(Mongez.)*

7. Its ſolution renders that of ſilver in the nitrous acid turbid, at the ſame time that

8. It makes no change in that of nitrous ſelenite.

9. It obſtinately retains its acid in a red heat.

10. One hundred parts of this earthy ſalt contain, when well dried, about 42 of marine acid, 38 of calcareous earth, and 20 of water.

11. It is found in mineral waters, and in the ſalt works at Saltzburg. *(Kirwan.)*

IV. Aerated chalk, *(Calx aerata.)*

Whenever calcareous earth is overſaturated with the aerial acid, it becomes a true earthy neutral ſalt; becomes ſoluble in water, and has a ſlight pungent bitter taſte. It is commonly found diſſolved in waters, in conſequence of an exceſs of the aerial acid. When this greatly abounds, the water is ſaid to be hard *(cruda)*. By boiling or by evaporation, it depoſits ſtreaks or cruſts of calcareous matter.

But when the calcareous earth is only ſaturated with the aerial acid without exceſs, it is not eaſily ſoluble; it is then the calcareous ſpar, p. 71. col. 2. and is properly referred to the claſs of earths, p. 71. col. 1.

V. Vitriolated ponderous earth. *Terra ponderoſa vitriolata; barytes vitriolata.*

This earthy ſalt, known by the name of ponderous ſpar, is a combination of the ponderous earth deſcribed in p. 75. col. 1. with the vitriolic acid; and has been already treated of.

The nitrous ponderous earth, according to Bergman, has not yet been found, although it may perhaps exiſt ſomewhere, and of courſe be diſcovered in nature.

VI. Muriatic barytes, marine baro-ſelenite. *Barytes ſalita.*

This earthy ſalt conſiſts of marine acid united to the ponderous earth. It is ſaid to have been found in ſome mineral waters in Sweden; and may be known by its eaſy precipitability with vitriolic acid, and by the great inſolubility and weight of this reſulting compound, which is the true ponderous ſpar of the preceding ſection.

VII. Aerated ponderous earth. *Barytes aerata.*

This earthy neutral ſalt was found by Dr Withering in a mine at Alſton-moor in the county of Cumberland in England. He ſays that it is very pure, and in a large maſs. This ſubſtance is a new acquiſition to mineralogy, and may be turned to uſeful purpoſes in chemiſtry.

1. It efferveſces with acids, and melts with the blow-pipe, though not very readily.

2. In a melting furnace, it gave ſome ſigns of fuſion; but did not feel cauſtic when applied to the tongue, nor had it loſt its property of efferveſcing with acids.

3. But the precipitated earth from a ſaturated ſolution of it in the marine acid, by the mild vegetable or mineral alkali being burned, and thrown into water, gave it the properties of lime-water, having an acrid taſte in a high degree: and a ſingle drop of it added to the ſolutions of vitriolated ſalts, as the Glauber's ſalt, vitriolated tartar, vitriolic ammoniac, alum, Epſom ſalt, ſelenite, occaſioned immediately a precipitation; from whence it appears to be the niceſt teſt to diſcover the vitriolic acid. By it the marine acid may alſo be eaſily freed from any mixture of vitriolic acid, by means of this calx of ponderous earth. See CHEMISTRY n° 1049. *et. ſeq.*

VIII. Vitriolated magneſia.

This earthy neutral ſalt is called by the Engliſh *Epſom ſalt; Sel d'Angleterre* by the French, and alſo *ſel de Sedlitz, de Seydſchutz, ſel amer, ſel cathartique amer*, &c. Theſe various names are given to it, either on account of its properties, it being a very mild purgative; or from the places where it is found, beſides many others, as in the waters of Egra, of Creutzbourg, Obernental, Umea, &c. It has alſo been found native, mixed with common ſalt and coaly matter, germinating on ſome free ſtones in coal mines. See *Kirwan's Mineralogy*, p. 183.

1. It has a very bitter taſte.

2. It is ſoluble in one part and a half of its weight of cold water: but in hot water, a given weight of it diſſolves the double of this ſalt.

3. It effloreſces when expoſed to a dry atmoſphere, and is reduced to a white powder.

4. Expoſed to the fire, it loſes the water of its cryſtalliſation, and is reduced into a friable maſs.

5. This earthy ſalt is decompoſed by fixed and volatile alkalies.

6. Lime-water precipitates the magneſia from its ſolution, the calcareous earth of lime-water combining itſelf with the vitriolic acid, and forming a ſelenite. *N. B.* By this teſt the vitriolated magneſia is eaſily diſtinguiſhed from the vitriolated mineral alkali or Glauber's ſalt, which it reſembles.

7. But crude chalk, or aerated calcareous earth, has not ſuch an effect in the ſame caſe; which ſhows how much the efficacy of this ſubſtance, viz. the calcareous earth, is diminiſhed merely by its union with the aerial acid.

8. When urged by the flame with the blow-pipe, it froths; and may be melted by being repeatedly urged with that inſtrument.

9. With borax it efferveſces, and alſo when burned with the microcoſmic ſalt.

10 According to Bergman, 100 weight of this ſalt contains only 19 parts of pure magneſia, 33 of vitriolic acid: and 48 of water. But

11. According to Kirwan, 100 parts of it contain about 24 of real vitriolic acid, 19 of magneſian earth, and 57 of water.

IX. Nitrated magneſia; nitrous Epſom ſalt.

This earthy ſalt is uſually found together with nitre. It is a combination of the nitrous acid with the magneſian earth.

1. It has an acrid taſte, very bitter.

2. Attracts the moiſture from the atmoſphere, and deliqueſces.

3. Is very ſoluble in water.

4. Is eaſily decompoſable by fire.
5. The ponderous and calcareous earths decompoſe it, and alſo the alkalies.
6. On being urged by the blow-pipe, it ſwells up with ſome noiſe, but does not detonate.
7. If ſaturated ſolutions of nitrous ſelenite and of this ſalt be mixed, a precipitate will appear; but,
8. Neither vitriolic acid, nor mild magneſia, will occaſion any turbidneſs in its ſolution.
9. One hundred parts of this ſalt contain about 36 of real nitrous acid, 27 of magneſian earth, and 37 of water.

It exiſts in old mortar, and is found alſo in the mother liquor of nitre. As lime-water decompoſes it, M. de Morveau has indicated the uſe of this proceſs, not only to complete its analyſis; but alſo to ſeparate, in large quantities, and at a very cheap rate, the magneſian from the calcareous earth, as M. Mongez relates upon this ſubject.

X. Muriatic magneſia. *Magneſia ſalita.*

This earthy ſalt is a combination of magneſian earth with the muriatic acid. According to Bergman, it is found in the ſea in greater plenty than any other ſalt except the ſea-ſalt.

1. It has a very bitter taſte: and being always mixed in the ſea-water, it is the principal cauſe of its bitterneſs.
2. It is very deliſqueſcent, and ſoluble in a ſmall quantity of water.
3. All the alkalies, even the cauſtic volatile alkali and lime, decompoſe it by precipitating its baſis.
4. The vitriolic, nitrous, and boracic acids expel the muriatic acid from the baſe of this neutral ſalt.
5. Its ſolution does not trouble that of nitrous or marine ſelenite; but,
6. It cauſes a cloud in the nitrous ſolution of ſilver.
7. The vitriolic acid throws down no viſible precipitate from the ſolution of this neutral ſalt.
8. It loſes its acid in a red heat.

XI. Aerated magneſia.

Common magneſia, with an exceſs of aerial acid is a true neutral ſalt, like the aerated ſelenite of p. 96, col. 1. and becomes ſoluble in cold water. Otherwiſe it is ſcarce ſoluble at all; and is then claſſed among the earths.

This neutral ſalt is decompoſable by fire, by which its water and its acid are expelled; and it may become phoſphoric.

When urged by fire, it agglutinates a little: and ſome pretended that it melts. But it muſt be in an impure ſtate to vitrify at all.

The three mineral acids, and the alkalies, diſſolve this ſalt with effervescence, by expelling the aerial acid.

XII. Argillaceous earth combined with vitriolic acid. The *alum* kind. See Alum, and Chemistry-*Index*.

a. With a ſmall quantity of clay; native or plumoſe alum.

It is found on decayed alum ores in very ſmall quantities; and therefore, through ignorance, the alabaſtrites and ſelenites, both of which are found among moſt of the alum ſlates, are often ſubſtituted in its ſtead, as is alſo ſometimes the aſbeſtus, notwithſtanding the great difference there is between the alum and theſe both in regard to their uſes and effects.

b. With a greater quantity of pure clay; white alum ore.

1. Indurated pale-red alum ore, *(ſchiſtus aluminis Romanus.)* It is employed at Lumini, not far from Civita Vecchia in Italy, to make the pale-red allum called *roch allum.* This is, of all alum ores, the moſt free from iron; and the reddiſh earth which can be precipitated from it, does not ſhow the leaſt marks of any metallic ſubſtance.

c. With a very large quantity of martial clay, which likewiſe contains an inflammable ſubſtance: Common alum ore. This is commonly indurated and ſlaty, and is therefore generally called *alum ſlate.*

It is found,

1. With parallel plates, having a dull ſurface; from Andrarum in the province of Skone, Hunneberg and Billingen in the province of Weſtergottland, Rodoen in the province of Jemtland, and the iſland of Oeland, &c. In England, the great alum works at Whitby in Yorkſhire are of this kind.
2. Undulated and wedge-like, with a ſhining ſurface. This at the firſt ſight reſembles pit-coal; it is found in great abundance in the pariſh of Nas in Jemtland.

XIII. Argillaceous earth ſaturated with muriatic acid. *Argilla ſalita.*

Profeſſor Bergman ſays, that the combinations of the argillaceous earth with the nitrous, muriatic, and aerial acids, had not yet been found naturally formed as far as he knew. But Dr Withering affirms, that he found the muriatic argil to exiſt in a conſiderable quantity, in the Nevil Holt water, when he analyſed that mineral water about the year 1777: and he adds, that it is probably contained alſo in the Ballycaſtle water in Ireland.

XIV. Argillaceous earth mixed with volatile alkali.

[Although this mixture is by no means a neutral ſalt, this ſeems to be the place to treat of it according to the order of ſaline ſubſtances adopted in this article.]

The greateſt part of the clays contain a volatile alkali, which diſcovers itſelf in the diſtillation of the ſpirit of ſea-ſalt, &c.

Order V. Metallic Salts.

The native ſalts belonging to this diviſion may be diſtinguiſhed by the phlogiſticated alkali, which precipitates them all. The few which have ſaline properties, according to the definition of ſalts formerly given, ſhall be mentioned here; referring the reſt to the mineraliſed metals; as the *luna cornea,* the ſaline quickſilver or muriatic mercury, &c.

I. Vitriol of copper; Blue vitriol. *Vitriolum veneris, ſeu cyprium.*

This neutral metallic ſalt is a combination of the vitriolic acid with copper, and is found in all *cement waters*, as they are called. Its colour is a deep blue; and being long expoſed to the air, it degenerates into a ruſty yellow blue. Urged by the flame of the blow-pipe on a piece of charcoal, it froths at firſt with noiſe, giving a green flame, and the metallic particles are often reduced to a ſhining globule of copper, leaving an irregularly figured ſcoria. But with borax the ſcoria is diſſolved, and forms a green glaſs.

This ſalt rarely occurs cryſtalliſed: but is often found naturally diſſolved in water in Hungary, Sweden, and Ireland: from this water a blue vitriol is generally prepared. Theſe natural waters are called *cementatory* or *cementing* ones. According to Monet, this concrete ſalt, when found naturally formed, only proceeds from the evaporation of ſuch waters. It is alſo occaſionally extracted from ſulphurated copper ores after torrefaction. See CHEMISTRY-*Index*, at *vitriol.*

II. Muriatic copper, or marine ſalt of copper. *Cuprum ſalitum.*

This ſalt has been found in Saxony, in the mine of Johngeorgenſtadt. 1. It is of a greeniſh colour, and foliated texture. 2. It is moderately hard. 3. Sometimes it is tranſparent and cryſtalliſed.

It has been taken for a kind of mica: but Profeſſor Bergman found it to conſiſt of copper and marine acid, with a little argillaceous earth.

Another ſpecimen of a purer ſort was depoſited in the muſeum of Upſal. This is of a bluiſh green colour, and friable. It efferveſced with nitrous acid, to which it gave a green colour: and by adding a proper ſolution of ſilver, a *luna cornea* was formed, by which the preſence of the muriatic acid was aſcertained. (*Kirwan* and *Bergman.*)

III. Martial vitriol; vitriol of iron. Common green vitriol or copperas.

This is the common green vitriol, which is naturally found diſſolved in water, and is produced in abundance by decayed or calcined marcaſites.

This metallic neutral ſalt reſults from the combination of the vitriolic acid with iron.

1. It is of a greeniſh colour when perfectly and recently cryſtalliſed; but,
2. Effloreſces by being expoſed to the air, becomes yellowiſh, and is covered with a kind of ruſt. Sometimes it becomes white by long ſtanding.
3. It requires ſix times its weight of water, in the temperature of 60 degrees, to be diſſolved.
4. It has an aſtringent, harſh, and acidulous taſte.
5. Expoſed to a moderate heat, even to that of the ſunſhine, it falls into a yellowiſh powder: but,
6. On being expoſed to a ſudden heat, it melts; and on cooling, aſſumes a whitiſh brown colour.
7. When ſtrongly urged by fire, it loſes its acid, becomes of a dark red colour, and is then called *colcothar*; a powder which is employed in poliſhing metals, and to which the artiſts have applied the improper name of *crocus martis*, though this name only belongs to the yellow preparations of the iron-calces, uſed in pharmacy and in enamelling, &c.
8. Pure fixed alkali precipitates the iron from its ſolution in deep green flakes; the mild alkali, in a greeniſh white colour; pure volatile alkali, in ſo deep a green, that it appears black; but the mild volatile alkali precipitates it in a greyiſh-green colour.
9. All vegetable aſtringents, as the tincture of tea, quinquina, gales, &c. precipitate the iron in a black colour: hence they are uſed as teſts to diſcover its preſence in chemical analyſes; and it is from this black precipitate that the common writing ink is made, being diluted in water, and there ſuſpended by the Arabic or Senegal gums.
10. One hundred parts of this ſalt, recently cryſtalliſed, contain 20 of real vitriolic acid, 25 of iron, and 55 of water.
11. Its acid is known by this, that its ſolution mixes without turbidity with the ſolutions of other ſalts that contain vitriolic acid; as Epſom, ſelenite, vitriolated tartar, &c.
12. And the baſis of this metallic ſalt is known by the black colour produced by the ſolution of vegetable aſtringents.

83. On being urged by the flame thrown by the blow-pipe, it offers the ſame phenomena as the vitriol of copper, except that it does not colour the flame.

Green vitriol is frequently found native, either in coal mines or in the cavities of pyritaceous mines, or adhering to their ſcaffolds in a ſtalactitical form. It is found alſo in ſmall round ſtones, called *ink-ſtones*, of a white, red, grey, yellow, or black colour, which are almoſt ſoluble in water, and contain a portion of copper and zinc. Alſo ſometimes in form of ſchiſtus or ſlaty pyritaceous ſtones. But the greateſt part of that in uſe is prepared by art, from the martial pyrites or mundic. See CHEMISTRY, n° 619.

IV. Aerated iron. *Ferrum aeratum.*

This metallic ſalt is a combination of the aerial acid with iron; and is found in the light chalybeate waters, where it is diſſolved by an exceſs of this acid.

Mr Lane was the firſt who diſcovered in England the action of the aerial acid on iron, when the water is impregnated with that menſtruum. The late R. Rouelle demonſtrated the ſame phenomenon in France upon this and other metals. But Profeſſor Bergman ſeems to have preceded them both nearly about the ſame time, though neither had any knowledge of each other's diſcoveries.

The great volatility of this acid is the cauſe why this neutral ſalt is not often found. For the mere evaporation of the ferruginous mineral waters, in order to analyſe them, is ſufficient to let looſe the aerial acid; ſo that the iron which was there diſſolved by its power falls down to the bottom in the form of a light ore, which amounts to nearly $\frac{1}{10000}$ of the weight of the water; and

Metallic Neutral Salts.

when freſh retains ſo much phlogiſton as to obey the magnet, as Bergman ſays.

V. Vitriol of cobalt, or vitriolated cobalt.

This metallic ſalt reſults from the combination of the vitriolic acid with cobalt.

1. When found native, it is always in an effloreſcent ſtate; whence it ariſes that, in this caſe,

2. Its colour is greeniſh, mixed with a grey tint: but,

3. It is of a roſy colour when artificially made;

4. Effloreſces when expoſed to the action of the atmoſphere; and,

5. Takes then a greeniſh colour mixed with a pale purple, or a *Lilias colour*, as the French call it.

6. It is difficultly ſoluble in water; and,

7. Its ſolution is of a red colour.

8. The phlogiſticated alkali precipitates the cobalt from the ſolution of this ſalt, which with borax gives an azure glaſs.

By the above qualities, chiefly the roſy colour of the ſolution of this neutral ſalt, its baſis is ſufficiently diſtinguiſhed. As to its acid, it is eaſily known by the ſame teſts as thoſe of the preceding vitriols.

It is ſaid to be found native in ſmall pieces, mixed with a greeniſh effloreſcence in cobalt mines. (*Kirwan* and *Mongez.*)

VI. Vitriol of zinc, vitriolated zinc, or white vitriol.

This neutral metallic ſalt reſults from the combination of vitriolic acid with zinc.

1. Its colour is white. It,

2. Requires little more than twice its weight of water to diſſolve it in the temperature of 60 degrees of Fahrenheit's thermometer, and depoſits a greyiſh yellow powder.

3. Its ſpecific gravity is 2000.

4. Its taſte is very ſtyptic.

5. It mixes uniformly with vitriolic neutral ſalts.

6. Precipitates nitrous or marine ſelenites from their ſolutions, by which its acid is aſcertained.

7. It is precipitable in a whitiſh powder by alkalies and earths; but,

8. Neither iron, copper, nor zinc, precipitate it: by which circumſtance its baſis is ſufficiently indicated.

9. If it contains any other metallic principle, this may be precipitated by adding more zinc to the ſolution; excepting iron, which will of itſelf precipitate by expoſure to the air or boiling in an open veſſel.

10. One hundred parts of this metallic ſalt contain 22 of vitriolic acid, 20 of zinc, and 58 of water.

11. Urged by fire, it loſes a good part of its acid.

12. Treated with the blow-pipe it exhibits nearly the ſame phenomena as other metallic vitriols; except only that the flame is brilliant when the zinc is reduced, and gives out white flocs called *flowers of zinc*.

This neutral metallic ſalt is ſometimes found native, mixed with vitriol of iron, and in the form of white hairy cryſtals; or in a ſtalactitical form in the mines of Hungary, or as an effloreſcence on ores of zinc. It is alſo found diſſolved in mineral waters, and generally with ſome proportion of vitriols of iron and copper. Bergman ſays it is ſometimes produced by the decompoſition of pſeudogalæna, or black-jack; but this rarely happens, becauſe this ſubſtance does not readily decompoſe ſpontaneouſly.

But that in common uſe is moſtly prepared at Goſlaar, from an ore which contains zinc, copper, and lead, mineraliſed by ſulphur and a little iron. The copper is firſt ſeparated as much as poſſible: the remainder after torrefaction and diſtillation is thrown red-hot into water and lixiviated. It is never free from iron. (*Kirwan*, *Mongez.*)

Triple Neutral Salts.

VII. Vitriolated nickel, or vitriol of nickel.

This neutral metallic ſalt reſults from the combination of the vitriolic acid with nickel. It exiſts ſometimes in conſequence of the decompoſition of the ſulphureous ores of this ſemimetal. It is found native, effloreſcing on Kupfer-nickel; and generally mixed with vitriol of iron.—It is of a green colour, as well as its ſolution. It is precipitated by zinc; but when joined with iron, this laſt is not precipitated by the ſame.

Its origin is perhaps owing to the decompoſition of the pyritaceous and ſulphureous ore of Kupfer-nickel, mentioned by Wallerius. This ore contains a great quantity of arſenic and ſulphur, as well as cobalt, nickel, and iron. And if it comes to be decompoſed in the bowels of the earth, it is natural to expect that the vitriolic acid of the ſulphur will attack the nickel and the iron, with which it will form neutral metallic ſalts (*Mongez*, *Kirwan.*)

VIII. Muriatic manganeſe. *Manganeſium ſalitum.*

M. Hielm is the only perſon who has as yet found this middle ſalt in ſome mineral waters of Sweden. It is compoſed by the combination of the regulus of Manganeſe with muriatic acid.

1. It is precipitated of a whitiſh yellow colour, by the Pruſſian (phlogiſticated) alkali; and of a browniſh yellow, by the mineral alkali. 2. It does not cryſtalliſe in any diſtinct form. 3. It abſtracts the moiſture of the air. 4. To obtain its baſis free from iron, it muſt be precipitated by the mineral alkali; rediſſolved in nitrous acid; then calcined until this acid is expelled; and the reſiduum is to be treated with diſtilled vinegar, which will then take up only the manganeſe. (*Kirwan.*)

Order. VI. TRIPLE SALTS.

THE neutral ſalts hitherto enumerated are ſuch as are compoſed of two ingredients only; but ſometimes three or more are ſo united as not to be ſeparated by cryſtallization. The vitriols that we are acquainted with are hardly ever pure; and two or three of them ſometimes are joined together.

Sometimes likewiſe it happens that neutral ſalts join earthy ſalts, and earthy ſalts metallic ones. Bergman generally diſtinguiſhes compound ſalts according to

Triple Neutral Salts.

the number of their principles, whether the ſame acid be joined to ſeveral baſes, or the ſame baſe to different acids; or, laſtly, whether ſeveral menſtrua and ſeveral baſes are joined together. Hence ariſe ſalts triple, quadruple, &c. which the diligence of after-times muſt illuſtrate. The moſt remarkable examples of triple and quadruple native ſalts which have yet occurred are,

I. Mineral alkali, with a ſmall quantity of calcareous earth. *Alkali fixus communis.* Aphronitrum.

This is ſo ſtrongly united with the calcareous earth, that the latter enters with it into the very cryſtals of the ſalt: though by repeated ſolutions the earth is by degrees ſeparated from it, and falls to the bottom after every ſolution.

It grows in form of white froſt on walls, and under vaults; and in places where it cannot be waſhed away by the rain.

Hence it would appear, that this is not only a *triple*, but a *multiple* ſalt; as theſe pieces of old mortar covered with this white froſt, on ancient walls, are the very ſame from which the ſaltpetre makers extract the mother-water of nitre, after mixing therewith the vegetable aſhes, to furniſh the alkaline baſe to it. M. Fourcroy ſays in his ſeventeenth Lecture, that this mother-water contains not only nitre, but five other kinds of ſalt, viz. the *marine ſalt*, *nitrous magneſia*, *calcareous nitre*, *magneſia nitrata*, and *calx ſalita*; to which the chemiſts of Dijon add the *digeſtive ſalt of Sylvius*, and in ſome caſes various *vitriols* with *alkaline* or *earthy baſes*.

When it contains any conſiderable quantity of the calcareous earth, its chryſtals become rhomboidal, a figure which the calcareous earth often aſſumes in ſhooting into chryſtals: but when it is purer, the cryſtals ſhoot into a priſmatic figure.

This is a circumſtance which neceſſarily muſt confuſe thoſe who know the ſalts only by their figure; and ſhows, at the ſame time, how little certainty ſuch external marks afford in a true diſtinction of things.

This ſalt is very often confounded with the *ſal mirabile Glauberi.*

II. Common ſalt with magneſia; or muriatic mineral alkali contaminated by muriatic magneſia.

This is a compound of the common ſalt with muriatic magneſia: and by the expreſſion *contaminatum (inquinatum)* of profeſſor Bergman, we may ſuppoſe that the magneſian ſalt is not intimately united to the alkaline baſe.

This triple ſalt is very deliqueſcent; a quality it owes to its integrant part, the muriatic magneſia, (p. 79. col. 1.) For the pure muriatic alkali does not deliqueſce: but this degree of purity is ſeldom found, even in the native foſſil of *ſal gem*, (p. 93. col. 2.) In general all the earthy marine ſalts are very deliqueſcent, as the muriatic chalk, the muriatic barytes, and the muriatic magneſia. *Bergman*, *Macquer*, and *Mongez*.

III. Mineral alkali with ſuccinous acid and phlogiſton.

This ſubſtance will be afterwards mentioned among the *inflammables*.

IV. Vitriolated magneſia with vitriol of iron. Epſom ſalt contaminated with copperas.

Found in ſome mineral waters, according to Mr Monet, *(Treat. on Mineral Waters.)*

V. Native alum contaminated by copperas. Vitriolated argil with vitriol of iron.

Found in the aluminous ſchiſtus. It ſometimes eſfloreſces in a feathery form. Perhaps this is the *plumoſe alum* of the ancients.

VI. Native alum, contaminated by ſulphur.

At the places about Wedneſbury and Bilſton, in Staffordſhire, where the coal-pits are on fire, this ſubſtance ſublimes to the ſurface; and may be collected, in conſiderable quantity, during dry or froſty weather.

A ſimilar compound ſubſtance ſublimes at the Solfaterra near Naples.

VII. Native alum contaminated by vitriolated cobalt.

In the mines of Herregrund and Idria this ſalt may be ſeen ſhooting out into long ſlender filaments. Perhaps this is the *trichites* of the Greeks.

1. Diſſolved in water, it immediately betrays the preſence of vitriolic acid upon the addition of terra ponderoſa ſalita (muriatic acid ſaturated with heavy earth).
2. By the addition of phlogiſticated alkali, a precipitate of cobalt is thrown down, which makes blue glaſs with borax or microcoſmic ſalt. *(Berg. Sciag.)*

VIII. Vitriol of copper with iron.

This ſalt is of a bluiſh-green colour. It is the *vitriolum ferreo-cupreum cyaneum* of Linnæus. Its colour varies, being ſometimes more or leſs green, and ſometimes more or leſs blue. It is found at Saltzberg and at Falhun.* This vitriol is called *vitriol of Hungary*, becauſe it is found in the Hungarian mines of this kind. *(Mongez.)*

IX. Vitriol of copper, iron, and zinc.

This is the *vitriolum ferreo zinceo cupreum cyaneum* of Linnæus. Its colour is of a blue inclining to green. If rubbed on a poliſhed ſurface of iron, the copper is not precipitated thereby, as it happens to the blue vitriol; which ſhows that the vitriolic acid is perfectly ſaturated in this ſalt by the three metallic baſes.

X. Vitriol of copper and zinc.

This is the blue vitriol from Goſlar. According to Mongez it is the *vitriolum zinceo-cupreum cæruleum* of Linnæus.

XI. Vitriol of iron and zinc.

This is the green vitriol from Goſlar in the Hartz. According to Mongez, this is the *vitriolum zinceo ferreum viride* of Linnæus, 105. 6. Its colour is a pale-green caſt.

XII. Vitriol of iron and nickel.

This ſalt is of a deep-green colour, and is contained in the ochre, or decayed parts of the nickel, at the cobalt-mines of Los, in the province of Helſingland.

CLASS III. MINERAL INFLAMMABLE SUBSTANCES.

To this claſs belong all thoſe ſubterraneous bodies that are diſſoluble in oils, but not in water, which they repel:

repel; that catch flame in the fire; and that are electrical.

It is difficult to determine what conſtitutes the difference between the purer ſorts of this claſs, ſince they all muſt be tried by fire, in which they all yield the ſame product; but thoſe which in the fire ſhow their differences by containing different ſubſtances, are here conſidered as being mixed with heterogeneous bodies: that ſmall quantity of earthy ſubſtance, which all phlogiſta leave behind in the fire, is, however, not attended to.

I. Inflammable air; fire damp.

This aeriform ſubſtance is eaſily known by its property of inflaming when mixed with twice or thrice its bulk of common atmoſpheric air; and it is aſſerted to be the real phlogiſton almoſt pure. See Aerology-*Index* and *Inflammable Air*.

It admits conſiderable varieties, according to the nature of the ſubſtances from which it is produced, and often gives different reſiduums upon combuſtion, ſome of which are of the acid kind. If it is produced from charcoal, it yields aerial acid or fixed air: from ſolutions of metallic ſubſtances in the vitriolic, nitrous, or marine acids, it yields theſe reſpective acids, as M. Lavoiſier aſſerts.

Æther, converted into vapour in a vacuum, gives a permanent elaſtic vapour, which is inflammable. The atmoſphere, which floats round the fraxinella, is inflammable from the admixture of its vapours, which ſeem to be of the nature of an eſſential oil: ſo that on approaching the flame of a candle under this plant, in hot weather, it takes fire in an inſtant; although the eſſential oil, extracted from this plant by diſtillation, is not inflammable on account of the watery particles mixed with it, as M. Bomare aſſerts.

Mr Scheele is of opinion, that every inflammable air is compoſed of a very ſubtile oil. This coincides with the idea entertained by chemiſts of their phlogiſton; and is confirmed by the fact, of its being naturally found in thoſe ſprings from whence iſſues petrol, whoſe exhalations are very inflammable.

The reſiduum, which remains in the atmoſphere after the combuſtion of inflammable air, is extremely noxious to animals. Doctor Prieſtley takes it to be a combination of phlogiſton with pure air, and on this account calls it *phlogiſticated air*. But M. Lavoiſier, on the contrary, conſiders it to be a primitive ſubſtance of an unchangeable nature, and gives it the ſingular name of *atmoſpheric mephitis*.

II. Hepatic air.

This air ſeems to conſiſt of ſulphur, held in ſolution in vitriolic or marine air. It is inflammable when mixed with three quarters of its bulk of common air. Nitre will take up about half the bulk of this air; and when ſaturated with it, will turn ſilver black: but if ſtrong dephlogiſticated nitrous acid be dropped into this water, the ſulphur will be precipitated.

One hundred cubic inches of this air may hold eight grains of ſulphur in ſolution in the temperature of 60°; and more if hotter.

Atmoſpheric air alſo decompoſes hepatic air.

It is found in many mineral waters, and particularly in the hot baths of Aix-la-Chapelle. The cauſe and manner of their containing ſulphur which was long a problem, has at laſt been happily explained by Mr Bergman.

It plentifully occurs in the neighbourhood of volcanoes and in ſeveral mines.

Hepatic air is eaſily obtained by art, from all ſorts of liver of ſulphur, whether the baſe be an alkali, an earth, or a metal, if any acid is poured upon it; and the better, if uſe be made of the marine acid, becauſe it contains phlogiſton enough, and does not ſo ſtrongly attract that of the *hepar ſulphuris*. For this reaſon the nitrous acid is not fit for this proceſs, as it combines itſelf with the phlogiſton, and produces nitrous air. It may alſo be produced, by diſtilling a mixture of ſulphur and powdered charcoal, or of ſulphur and oil, &c. See the detached article *Hepatic Air*, and Aerology-*Index*.

III. Phlogiſton combined with aerial acid; black lead, or wadd. *Plumbago*. See the detached article *Black-Lead*.

It is found,

a. Of a ſteel-grained and dull texture. It is naturally black, but when rubbed it gives a dark lead colour.

b. Of a fine ſcaly, and coarſe-grained texture; coarſe black-lead.

IV. Mineral tallow. *Serum minerale*.

This was found in the ſea on the coaſts of Finland in the year 1736. Its ſpecific gravity is 0.770; whereas that of tallow is 0.969. It burns with a blue flame, and a ſmell of greaſe, leaving a black viſcid matter, which is with more difficulty conſumed.

It is ſoluble in ſpirit of wine only when tartariſed: and even then leaves an inſoluble reſiduum; but expreſſed oils diſſolve it when boiling.

It is alſo found in ſome rocky parts of Perſia, but ſeems mixed with petrol, and is there called *ſchebennaal, tſienpen, lodheti*.

Dr Herman of Straſburg mentions a ſpring in the neighbourhood of that city, which contains a ſubſtance of this ſort diffuſed through it, which ſeparates on ebullition, and may then be collected. *(Kirwan)*.

V. Ambergris. *Ambra griſea*.

It is commonly ſuppoſed to belong to the mineral kingdom, although it is ſaid to have doubtful marks of its origin (A).

c. It

(A) Ambergris, according to the aſſertion of M. Aublet (in his *Hiſtoire de la Guiane)*, is nothing more than the juice of a tree inſpiſſated by evaporation into a concrete form. This tree grows in Guyana, and is called

Inflammables.

α. It has an agreeable ſmell, chiefly when burnt:

β. Is conſumed in an open fire:

γ. Softens in a ſlight degree of warmth, ſo as to ſtick to the teeth like pitch.

δ. It is of a black or grey colour; and of a dull or fine grained texture (B).

The grey is reckoned the beſt, and is ſold very dear. This drug is brought to Europe from the Indies. It is employed in medicine; and alſo as a perfume (C).

VI. Amber. *Ambra flava, ſuccinum, electrum,* Lat. *Carabé,* French. *Agtſtein, Bernſtein,* Germ.

This ſubſtance is dug out of the earth, and found on the ſea-coaſts. According to the experiments of M. Bourdelin, it conſiſts of an inflammable ſubſtance, united with the acid of common ſalt, which ſeems to have given it its hardneſs.

It is ſuppoſed to be of vegetable origin, ſince it is ſaid to be found together with wood in the earth.

By Diſtillation it yields water, oil, and a volatile acid ſalt, which the abovementioned author has thought to be the acid of common ſalt united with a ſmall portion of phlogiſton.

Inſects, fiſh, and vegetables, are often found included in it, which teſtify its having once been liquid.

It is more tranſparent than moſt of the other bitumens; and is doubtleſs the ſubſtance which firſt gave riſe to *electrical experiments* (on account of the power it poſſeſſes of attracting little bits of ſtraw, or of other light ſubſtances, when rubbed).

Its varieties are reckoned from its colour and tranſparency. It it is found,

A·

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called *cuma* but has not been inveſtigated by other botaniſts. When ſome branches are broken by high winds, a large quantity of the juice comes out; and if it chances to have time to dry, various maſſes (ſome of which had been ſo large as to weigh 1200 pounds and more) are carried into the rivers by heavy rains, and through them into the ſea: afterwards they are either thrown into the ſhore or eaten by ſome fiſh, chiefly the ſpermaceti whale, known by the name of *Phyſeter-macrocephalus* among ichthyologiſts. This kind of whale, is very greedy of this gum-reſin, and ſwallows ſuch large quantities when they meet with it, that they generally become ſick; ſo that thoſe employed in the fiſhery of theſe whales, always expect to find ſome amber mixed with the excrements and remains of other food in the bowels of thoſe whales who are lean. Various authors, among whom is Father Santos in his *Ethiopia Orientalis*, who travelled to various places of the African coaſt, and Bomare, ſay, that ſome ſpecies of birds are fond of eating this ſubſtance as well as the whales and other fiſhes. This accounts very well for the claws, beaks, bones, and feathers of birds, parts of vegetables, ſhells, and bones of fiſh, and particularly for the beaks of the cuttle fiſh or *ſepia octopedia*, that are ſometimes found in the maſs of this ſubſtance. Dr Swediar, however, attended only to theſe laſt, though he had mentioned alſo the other ſubſtances in his paper inſerted in the Philoſophical Tranſactions for 1783; wherein he attempts to eſtabliſh an opinion, that the amber is nothing elſe but a preternaturally hardened dung, or feces, of the phyſeter whale. Dr Withering and Mr Kirwan have embraced this notion; as did alſo, inadvertently, the editors of this Work. See AMBERGRIS.

(B) Mr Aublet brought ſpecimens of this gum-reſin, which he collected on the ſpot, from the cuma tree at Guiane. It is of a whitiſh-brown colour with a yellowiſh ſhade, and melts and burns like wax on the fire. The ſingularity of this gum-reſin is, that it imbibes very ſtrongly the ſmell of the aromatic ſubſtances which ſurround it; and it is well known that perfumers avail themſelves very conſiderably of this advantage. M. Rouelle examined very carefully this ſubſtance brought over by Mr Aublet, and found that it produced the very ſame reſults as in other good kinds of amber. Beſides Mr Aublet's authority, which is deciſive, as being grounded upon direct proofs of fact, Rumphius, quoted by Bergman, long ſince mentioned a tree called *Nanarium*, whoſe inſpiſſated juice reſembles amber. It cannot therefore at preſent be doubted that the origin of this phlogiſtic ſubſtance is the vegetable kingdom, although it may be often found and reputed as a product of the foſſile kind.

This ſubſtance being analyſed by Meſſrs Geoffroy and Newman, quoted M. Fourcroy, yielded them the ſame principles as the bitumens; viz. an acid ſpirit, a concrete acid ſalt, ſome oil, and a charry reſiduum: which evidently evinces, that all theſe fat and oily foſſile ſubſtances have their origin from the other two kingdoms of nature.

(C) Ambergris is not only brought from the Eaſt Indies, but from the coaſts of the Bahama Iſlands, Braſil, Madagaſcar, Africa, China, Japan, the Molucca iſlands, the coaſts of Coromandel, Sumatra, &c. Dr Lippert, in a treatiſe he publiſhed at Vienna 1782, entitled *Phlogiſtologia Mineralis*, has copied chiefly from Wallerius what he aſſerts of this ſubſtance. He affirms that there are eight known ſpecies of amber; five of a ſingle colour, viz. the white and the black from the iſland of Nicobar, in the gulph of Bengal, the aſh-coloured, the yellow, and the blackiſh; and two variegated, viz. the grey coloured with black ſpecks, and the grey with yellow ſpecks. This laſt he aſſerts to be the moſt eſteemed on account of its very fragrant ſmell, and to come from the South coaſt of Africa and Madagaſcar, as well as from Sumatra; and that the black dark coloured amber is often found in the bowels of cetaceous fiſhes. The ſame author adds alſo from Wallerius, that by diſtilling the oil of yellow amber *(ſuccinum)* with three parts and a half of fuming nitrous acid, a reſiduum remains like roſin, which emits a perfect ſmell of muſk; whence ſome conclude, that the ambergris belongs to the foſſile kind: the contrary, however, is evinced in the preceding note.

Inflammables.

A. Opaque.
a. Brown.
b. White.
c. Blackiſh.
B. Tranſparent.
a. Colourleſs.
b. Yellow.

The greateſt quantity of European amber is found in Pruſſia; but it is, beſides, collected on the ſea-coaſt of the province of Skone, and at Biorko; in the lake Malaren in the province of Upland; as alſo in France and in Siberia. It is chiefly employed in medicine and for making varniſhes (D).

VII. Rock-oil.

This is an inflammable mineral ſubſtance, or a thin bitumen, of a light brown colour, which cannot be decompoſed; but is often rendered impure by heterogeneous admixtures. By length of time it hardens in the open air, and then reſembles a vegetable reſin; in this ſtate it is of a black colour, whether pure or mixed with other bodies. It is found,

A. Liquid.

1. Naphtha.

This is of a very fragrant ſmell, tranſparent, extremely inflammable, and attracts gold. It is collected on the ſurface of the water in ſome wells in Perſia. See NAPHTHA.

2. Petrol.

This ſmells like the oil of amber, though more agreeable; and likewiſe very readily takes fire. It is collected in the ſame manner as the Naphtha from ſome wells in Italy. See PETROLEUM.

B. Thick and pitchy; *Petroleum tenax.* Barbadoes-tar.

This reſembles ſoft pitch.

It is found at the Dead Sea in the Holy Land; in Perſia, in the chinks of rocks, and in ſtrata of gypſum and limeſtone, or floating on water: alſo in Siberia, Germany, and Switzerland, in coal-pits: and in America: likewiſe in Colebrookdale in England.

C. Elaſtic petrol.

This is a very ſingular foſſil, found of late in England.

By its colour and conſiſtency, it exactly reſembles the Indian-rubber, or the gum-reſin, from the north part of Braſil, called *caoutchouc.* It is of a dark brown colour, almoſt black; and ſome is found of a yellowiſh brown caſt, like the ſame gum-reſin.

With reſpect to its elaſtic conſiſtence, it hardly can be diſtinguiſhed from it, except in the coheſion of its particles, which is weaker.

It has the ſame property of rubbing off from paper the traces of black-lead pencils.

It burns likewiſe with a ſmoky flame; and alſo melts into a thick oily fluid; but emits a diſagreeable ſmell, like the foſſile pitch, or Barbadoes tar.

It

(D) Amber, ſays M. Fourcroy, is found in ſmall detached pieces, for the moſt part under coloured ſands, diſperſed in beds of pyritaceous earth; and above it is found wood, charged with a blackiſh bituminous matter. Hence it is ſtrongly ſuppoſed that it is a reſinous ſubſtance, which has been altered by the vitriolic acid of the pyrites, notwithſtanding that we know that acids, when concentrated, always blacken and charry reſinous ſubſtances. In fact, the chemical analyſis of this ſubſtance rather confirms that ſuppoſition.

The ſingular opinion of Dr Girtanner, about the yellow amber being produced by a kind of ants, may be ſeen in *Journal de Phyſique* for March 1786, page 227. Or ſee the article AMBER in this Dictionary.

The colour, texture, tranſparency, and opacity of this ſubſtance, have ſhown ſome other varieties beſides theſe mentioned in the text. The principal ones are the following:

6. The yellow ſuccinum,	opaque.	9. The white,	tranſparent.
7. The coloured green or blue by foreign matter.		10. The pale-yellow,	
8. The veined ſuccinum,		11. The citron-yellow,	
		12. The deep-red,	

The golden yellow tranſparent amber, mentioned in the text, is what the ancients called *chryſolectrum,* and the white opaque was called *leucolectrum.*

But we muſt be cautious about the value of the ſpecimens remarkable for their colour, ſize, tranſparency, and the well-preſerved inſects they contain internally; ſince there is a probability of deception, ſeveral perſons poſſeſſing the art of rendering it tranſparent and coloured, and of ſoftening it, ſo as to introduce foreign ſubſtances, &c. into it at pleaſure.

M. Fourcroy ſays, that two pieces of this ſubſtance may be united, by applying them to one another, after being wet with oil of tartar and heated. And Wallerius mentions, that pieces of yellow amber may be ſoftened, formed into one, and even diſſolved by means of oil of turnip-ſeed, in a gentle heat; and that according to ſome authors, it may be rendered pure and tranſparent, by boiling it in rape-ſeed oil, linſeed oil, ſalt-water, &c.

Mr Macquer ſays, that for the purpoſe of making varniſh, this ſubſtance muſt undergo beforehand a previous decompoſition by torrefaction, in order to be diſſolved by linſeed-oil or eſſential oils. See VARNISH.

Beſides the making of varniſhes, this ſubſtance was much employed formerly in making various pieces of ornament and jewellery. The beſt pieces were cut, turned, carved, or plained, to make vaſes, heads of canes, collars, bracelets, ſnuff-boxes, beads, and other toys, ſmall fine cheſts, &c. But after diamonds and beautiful hard ſtones were brought into uſe, theſe trinkets are little conſidered in Europe: nevertheleſs, they are ſtill ſent to Perſia, China, and to various other eaſtern nations, who eſteem them ſtill as great curioſities.

Inflammables.

It is found in the ſame earthy and ſtony beds as petrol. Some ſpecimens are of a cylindrical form, like bits of thin branches or ſtalks of vegetables, though much more ſolid, being perfectly elaſtic.

M. Magellan obſerves, that this foſſil ſeems to favour the opinion of theſe mineralogiſts, "who believe that theſe oily combuſtibles derive their origin from the vegetable kingdom. It ſeems worth trying, whether pieces of aſphaltum, buried in damp beds of ſparry rubbiſh, or other kind of earths, would take the ſame elaſtic conſiſtence. But ſince many beds of ſhells and other foſſile ſubſtances, both of the vegetable and animal kind, as impreſſions of various plants, and the remains of various quadrupeds, &c. have been found in different parts of the globe, whoſe individual ſpecies undoubtedly exiſt no longer alive unleſs in far diſtant climates, and in the moſt remote countries from the ſpot where their exuvia are dug out; why ſhould we not allow that this new foſſil may be the ſame original elaſtic gum, now growing naturally in Braſil, China, and other hot climates, only altered in its ſmell, and in the tenacity of its particles, by its long depoſition during centuries in the bowels of the earth?"

This elaſtic petrol was found in 1785, near Caſſel-town, in the county of Derbyſhire in England, but in very inconſiderable quantities.

D. Hardened rock-oil; foſſile pitch. *Petroleum induratum*, *Pix montana.*

1. Pure aſphaltum.

This leaves no aſhes or earthy ſubſtance when it is burnt.

It is a ſmooth, hard, brittle, inodorous, black or brown ſubſtance. When looked through in ſmall pieces, appears of a deep red colour. It ſwims in water.

It breaks with a ſmooth ſhining ſurface.—Melts eaſily: and, when pure, burns without leaving any aſhes; but if impure, leaves aſhes or a ſlag.

According to M. Monet, it contains ſulphur, or at leaſt the vitriolic acid.

It is ſlightly and partially acted on by alcohol and æther.

From this, or the preceding ſubſtance, it is probable the aſphaltum was prepared that the Egyptians uſed in embalming their dead bodies, and which is now called *mummia*.

It is found alſo on the ſhores of the Red Sea, in the Dead Sea, in Germany, and France.—(*Kirwan.*)

And it comes likewiſe from Porto Principe, in the iſland of Cuba. (*Brun.*)

It is found alſo in many parts of China: and is employed as a covering to ſhips by the Arabs and Indians. (*Fourcroy.*)

2. Impure; *Pix montana impura.* Piſſaphaltum.

This contains a great quantity of earthy matter, which is left in the retort after diſtillation, or upon the piece of charcoal, if burnt in an open fire; it coheres like a ſlag, and is of the colour of black-lead: but in a calcining heat, this earth quickly volatiliſes, ſo that the nature of it is not yet known.

It is found in Moſſgrufvan in Norberg, and in Grengierberget, both in the province of Weſtmanland; and alſo in other places.

The piſſaphaltum is of a mean conſiſtence between the aſphaltum and the common petroleum. It is the very bitumen which is collected in Auvergne in France in the well called *de la Pege*, near Clermont Ferrand.

VIII. Jet. *Gagas*, *Succinum nigrum.*

This is a very compact bitumen, harder than aſphaltum, always black, and ſuſceptible of a good poliſh. It becomes electrical when rubbed; attracts light bodies like the yellow amber; and it ſwims on water.

It ſeems to be nothing elſe than a black amber, or ſuccinum; but ſpecifically lighter, on account of the greater portion of bitumen that enters into its compoſition. When burned, it emits a bituminous ſmell. See the article Jet.

IX. Mineral phlogiſton united with earths.

A. With calcareous earth.

1. With pure calcareous earth. This is the fetid or ſwine ſpar formerly deſcribed.

B. United with calcareous, argillaceous, ponderous, and ſiliceous earth and vitriolic acid. Liverſtone: *Lapis hepaticus.*

C. With an argillaceous earth; Pit or Stone Coal.

1. With a ſmall quantity of argillaceous earth and vitriolic acid. *Lithanthrax.* See the articles Coal and Pit-coal.

This is of a black colour, and of a ſhining texture: it burns with a flame, and is moſtly conſumed in the fire; but leaves, however a ſmall quantity of aſhes.

a. Solid coal. *b.* Slaty coal.

2. Culm-coal, called *kolm* by the Swedes.

This has a greater quantity of argillaceous earth and vitriolic acid, and a moderate proportion of petrol.

It has the ſame appearance with the preceding one, though of a more dull texture: it burns with a flame; and yet is not conſumed, but leaves behind a ſlag of the ſame bulk or volume as the coal was.

From England, and among the alum rocks at Meltorp and Billingen in the province of Weſtergottland.

3. Slate-coal.

This coal contains abundance of argillaceous earth. It burns with a flame by itſelf, otherwiſe it looks like other ſlates.

It is found at Gullerafen in the pariſh of Rettwik, in the province of Dalarne, and alſo with the coals at Boſerup in Skone.

This ſeems to be the ſame with the bituminous ſchiſtus, already deſcribed among the argillaceous earths.

4. Cannel-coal.

Mr Kirwan has put together this variety of coal with that other called *Killkenny-coal*, tho' they have ſome different properties.

The cannel-coal is of a dull black colour; breaks eaſily in any direction; and, in its fracture, preſents a ſmooth conchoidal ſurface, if broken tranſverſely.

It contains a conſiderable quantity of petrol, in a leſs denſer ſtate than other coals; and burns with a bright lively flame, but is very apt to fly in pieces in the fire. It is ſaid, however, to be entirely deprived of this property, by being previouſly immerſed in water for ſome hours.

Its ſpecific gravity is about 1270; and being of an uniform hard texture may be eaſily turned in the lathe, and receive a good poliſh.

It is from this kind of coal that ſmall vaſes, as ink-ſtands, various trinkets, and other curioſities, are made in England, which appear as if made of the fineſt jet.

5. Kilkenny-coal.

This contains the largeſt proportion of petrol or aſphaltum; burns with leſs flame and ſmoke, and more ſlowly, though intenſely, than the cannel-coal.

The quantity of earth in this coal does not exceed one-twentieth of its weight. Its ſpecific gravity is about 1400. It is frequently mixed with pyrites.

It is found in the county of Kilkenny, belonging to the province of Leinſter in Ireland. The quality of this coal burning almoſt without ſmoke, is mentioned in a proverb by which the good qualities of that country are expreſſed.

6. Sulphureous coal.

This conſiſts of the former kinds of coal, mixed with a notable proportion of pyrites: hence it is apt to moulder and break when expoſed to the air. It contains yellow ſpots that look like metal; and burns with a ſulphureous ſmell, leaving either red aſhes, or a ſlag, or both. Water acts upon it, after it has mouldered. Its ſpecific gravity is = 1500, or more.

Beſides the above varieties, ſchiſtus, micaceous ſchiſtus, and gneiſs, are frequently found in the neighbourhood of coal-mines, ſo penetrated with petrol bitumen as to conſtitute an inferior ſpecies of coal; but the bitumen being burnt, they preſerve their form, and in ſome meaſure their hardneſs. Alſo ſome grey ſlates, that are ſo ſoft as to be ſcraped with the nail, and are greaſy to the touch, burn like coal.

All the differences of coal ariſe from a mixture of the varieties already mentioned; and it is obſervable, that wherever coals exiſt, ſlates are generally found near them. Salt or mineral ſprings are alſo often found in their neighbourhood. *(Kirwan.)*

7. Bovey coal. *Xylanthrax.*

This is of a brown, or browniſh black colour, and of a yellow laminar texture.

The laminæ are frequently flexible when firſt dug, though generally they harden when expoſed to the air.

It conſiſts of wood penetrated with petrol or bitumen; and frequently contains pyrites, alum, and vitriol.

Its aſhes afford a ſmall quantity of fixed alkali, according to the German chemiſts; but according to Mr Mills, they contain none.

By diſtillation it yields an ill ſmelling liquor, mixed with a volatile alkali and oil, part of which is ſoluble in ſpirit of wine, and part inſuſible, being of a mineral nature.

It is found in England, France, Italy, Swiſſerland, Germany, Ireland, &c. *(Kirwan.)*

8. Peat. *Geanthrax.*

There are two ſorts of inflammable ſubſtances known by this name, viz.

The firſt of a brown, yellowiſh brown, or black colour, found in mooriſh grounds; in Scotland, Holland, and Germany. When freſh, it is of a viſcid conſiſtence, but hardens by expoſure to the air. It conſiſts of clay mixed with calcareous earth and pyrites; and ſometimes contains common ſalt. While ſoft, it is formed into oblong pieces for fuel, after the pyritaceous and ſtony matters are ſeparated. When diſtilled, it affords water, acid, oil, and volatile alkali. Its aſhes contain a ſmall proportion of fixed alkali. They are either white or red, according as it contains more or leſs ochre or pyrites.

The ſecond is found near Newbury in Berkſhire. It contains but little earth; but conſiſts chiefly of wood, branches, twigs, roots of trees, with leaves, graſs, ſtraw, and weeds. *(Kirwan.)*

9. Stone-turf.

Cronſtedt has ranged the turf among the foſſils of his appendix; but as that called in England by the name of *ſtone-turf* contains a conſiderable proportion of peat, it may be mentioned with propriety in this claſs.

Soon after it is dug out from the ground, where it keeps a ſoft conſiſtence, it at firſt hardens; but afterwards it crumbles by long expoſure to the air.

As to the other common turf, it only conſiſts of mould interwoven with the roots of vegetables; but when theſe roots are of the bulbous kind, or in a large proportion, they form the worſt kind of turf.

Although it may appear incredible, it is nevertheleſs a real fact, that in England pit-turf is advantageouſly employed in Lancaſhire to ſmelt the iron-ore of that county. Mr Wilkinſon, brother-in law to Dr Prieſtley, and famous for his undertakings in the extenſive iron-works, perhaps the greateſt in Europe, makes uſe of pit-turf in his large ſmelting furnaces of that province.

THOSE foſſil ſubſtances, which furniſh fuel for the various purpoſes of human life, are diſtinguiſhed by the name of *coals*, on account of their being a ſuccedaneum for wood and other vegetable productions, which when dry or of an oleaginous kind ſerve for the ſame uſes. If theſe vegetable ſubſtances are deprived of the acceſs of air, by covering them after ignition, the half conſumed remainder, which is of a black colour, is called by the name of *coal* or *charcoal*; and from hence the foſſil which affords fuel has

Inflammables.

alſo been called by the ſame name, though of a very different nature.

Pit-coal and earth-coal are ſynonymous, and mean coals dug out of a pit or from the earth. But the lithanthrax denotes ſtone-coal, and more properly indicates the cannel-coal, which has the greateſt ſimilarity to a ſtony ſubſtance, by the dull appearance of its fracture, and by the uniform texture of its parts.

All theſe coals are in general a bituminous black or brown and dark ſubſtance: for the moſt part they have a lamellated texture, which breaks eaſily, and always with a ſhining ſurface.

The varieties of pit-coals abovementioned are the moſt remarkable, by which they may be diſtinguiſhed from one another. But they are far from being homogeneous in each kind; as the accidental qualities, and the various proportions of their component parts, produce a far greater number of properties, which renders them more or leſs fit for different purpoſes; though theſe are generally overlooked, and confounded with the common one of affording fuel for making fire to warm our rooms, or for culinary operations.

This foſſile bitumen, as Fourcroy remarks, being heated in contact with a body in combuſtion, and a free acceſs of air, kindles the more ſlowly, and with more difficulty, as it is more weighty and compact. When once kindled, it emits a briſk and very durable heat, and burns for a long time before it is conſumed. If extinguiſhed at a proper time, the remaining cinders may ſerve ſeveral times for a new firing with a ſmall addition of freſh coals. The matter that is burned, and produces the flame, appears very denſe, as if united to another ſubſtance which retards its deſtruction. Upon burning, it emits a particular ſtrong ſmell, which is not at all ſulphureous when the earth-coal is pure, and contains no pyrites.

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When the combuſtible, oily, and moſt volatile parts, contained in the earth-coal, are diſſipated and ſet on fire by the firſt application of heat; if the combuſtion is ſtopped, the bitumen retains only the moſt fixed and leaſt inflammable part of its oil, and is reduced to a true charry ſtate, in combination with the earthy and fixed baſe. Pit-coals in this charry ſtate are called *coaks*, which are capable of exciting the moſt intenſe heat; and are employed all over Britain in the ſmelting of iron, copper, and other metallic ores, to the greateſt advantage. See COAKS, COAL, COALERY, and PIT-COAL (E).

X. The

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† Nat. Hiſt. of the Mineral Kingdom.

(E) The coal-metals, or ſtone ſtrata incloſing coals, are very numerous. Mr Williams † gives the following general account of thoſe in Scotland.

The ſand-ſtones. Of theſe there is a great variety, diſtinguiſhable by colour, texture, and degrees of hardneſs, generally diſpoſed into thick, middling, and thin ſtrata. The only ſpecies our author takes notice of is the regular broad-bedded free-ſtone of a laminated texture. This commonly riſes in thin or middling ſtrata; appearing at the edges of a ſection, when broken or cut, to be formed of thin lamina or layers of ſand, equally laid on the whole breadth of the ſtone, and well cemented together. A great deal of both red and white free-ſtone riſe in layers of five or ſix inches, and ſo upwards, with regular ſtreaks of a fifth or ſixth part of an inch appearing the whole length of the ſtone, when the edge of a ſlab is poliſhed, as if ſo many gentle waves of water had formed the layer. The regularity of the ſtructure of this ſtone correſponds exactly with the regularity of its layers; and our author is of opinion, that the flaggy grey-ſtrata of free ſtone, with many of the black and grey-ſtrata of coal metals, the grey ſlate, as well as many other thin ſtrata of the coal metals, may be ranked with this free ſtone for perfect and regular ſtratification.

Along with theſe he claſſes ſome of the thin argillaceous ſtrata. "Many of the grey regularly ſtratified mountain limeſtones (ſays he) are alſo ſtreaked or ſtriped; and the ſtreaks in theſe appear more conſpicuous when broken than the ſtreaked free ſtones. Some of the hard regularly ſtratified mountain rocks are alſo ſtratified; and in all theſe three kinds of ſtones, the ſtreaks are regularly and exactly parallel to the bed of the ſtone."

Another remarkable inſtance of regularity of ſtrata is met with in the grey flaggy ſtrata of Caithneſs.—Throughout all the low country of Caithneſs, a ſquare of about 10 or 15 miles, there are bluiſh argillaceous ſtrata, with generally a ſmall quantity of lime in the compoſition of the ſtone, which is indurated to a greater degree than is common to ſuch thin ſtrata. The ſtone is ſtrong and tough, every where diſpoſed in thin broad-bedded, regular ſtrata; and in ſeveral parts of the country the flags are ſo thin and regular, and are raiſed ſo light and broad, that they are uſed for covering houſes; and three or four of them will cover the ſide of a ſmall one. Our author mentions a gentleman who has an eſtate on the ſouth ſide of the Pentland firth, and who in a bay there raiſes flags of any ſize and thickneſs he pleaſes; "ſo truly flat and ſmooth, that he has only to ſquare the edges to make of them good loft-floors, partitions, cheſts, mangers, roofs of houſes; in ſhort, he does every thing with them. The face of theſe flags are as ſmooth and true a plane, as if artificially finiſhed by the beſt workman."

In moſt coal fields there are a great variety of ſtrata of different kinds accompanying and lying between the ſeams of coal, of all ſorts of colours, conſiſtencies, and dimenſions; all of them blended together without any certain order or regularity; ſo that if there be 20 ſeams of coal, it is poſſible that there may be as many different roofs; that is, the ſtratum which is the immediate roof of one ſeam of coal, ſhall differ from that of another ſeam in quality, thickneſs, and colour, ſo that perhaps no two of the twenty ſhall be in any reſpect alike.

The various kinds of coal-roofs (*a*) commonly met with are the following.

1. *Ba-*

(*a*) The ſtratum which is placed immediately above a ſeam of coal, is called the roof of the coal, and that which is placed immediately below the ſeam, is called the pavement of the coal: which three, viz. the ſtratum of coal, and its roof and pavement, with the other concomitant ſtrata lying above and below them, always preſerve their ſtations and paralleliſm; that is, are all ſtretched out and ſpread one above another upon the ſame inclining plane, and have the ſame line of bearing and of declivity.

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X. The mineral phlogiſton or bitumen, united with the vitriolic acid: ſulphur or brimſtone. See the article SULPHUR.

This is very common in the earth, and diſcovers itſelf in many and various forms. It is found,

A. Native. *Sulphur nativum.*

Inflammables.

In this the two conſtituent parts are mixed in due proportion in regard to each other, according to the rules of that attraction which is between them. It is eaſily known,

1. By its inflammability, and by its flame.
2. By its ſmell when burnt; and,

3. By

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1. *Baſaltes.* This is very common in Scotland, where it is frequently called *whin* ſtone; and at Borrowſtounneſs there are ſeveral thick beds of it between the ſeems of coal. One of them being the immediate roof of a ſeam of coal there at Hillhouſe lime quarry, there is a thin ſeam of coal beneath a beautiful bed of columnar baſaltes. In the Bathgate hills to the ſouthward of Linlithgow, alſo, there are ſeveral ſtrata of coal blended with thoſe of baſaltes. Theſe baſaltine ſtrata are always very hard, frequently very thick, and generally of a black or blackiſh grey colour. "there are but few people (ſays Mr Williams) ſufficiently verſed in natural hiſtory, to know that they are baſaltes, as this kind of rock, both in England and Scotland, goes by the name of *whin rock.* In the north of Scotland it is called *ſkurdy;* and among the miners in Cornwall it has the name of *cockle* (*b*)."—

2. Strata of *limeſtone* of various thickneſſes are met with in different coal-fields. Sometimes the lime is the immediate roof; but ſometimes there is an argillaceous ſtratum of about the thickneſs of a foot between the coal ſtratum and that of lime. In the coal-fields at Gilmerton, near Edinburgh, are ſeveral beds of limeſtone, ſome of them very good, and of conſiderable thickneſs. At Blackburn in Weſt Lothian, alſo, there is a ſtratum of limeſtone ſix or ſeven feet thick, which is the immediate roof of a ſeam of coal about five or ſix feet thick. At Carlops and Spittlehaugh in Tweedale, they have a ſeam of coal immediately below their lime quarries, which they work for burning their lime.

3. *Poſt-ſtone,* a kind of thick and ſolid ſtratum of free ſtone, is one of the roofs of coal, generally without the intervention of any argillaceous ſtratum, though ſometimes a ſtratum of this kind is interpoſed. Frequently this kind of ſtone is rendered very hard by a mixture of iron or pyrites. In moſt coal fields, thinner ſtrata of free ſtone are met with as the roofs of coal ſeems.

4. *Dogger-band,* as it is called by the Scots colliers, is frequently met with as the roof of coal ſeams. This name is applied to various ſubſtances. Sometimes they call ſtrata of iron-ſtone *dogger bands;* ſometimes the name is reſtricted to the ball iron-ſtone; ſometimes to pyrites; and ſometimes the dogger band is a kind of imperfect ſtone, compoſed of ſeveral heterogeneous mixtures, among which pyrites bears a conſiderable proportion, and by which the whole is ſo ſtrongly bound together, that it is frequently very difficult to break through it.

5. *Whin-ſtone,* properly ſo called, not of a baſaltic nature. Theſe roofs are always very hard, and of various colours, as black, blackiſh grey, brown, red, &c. ſometimes not above two or three feet in thickneſs, but ſometimes much more.

6. *Poſt-ſtone,* of a ſofter nature than that already mentioned. This has no mixture of ferruginous matter.

7. *Regular ſtrata of free-ſtone,* of various colours, textures, and thickneſſes, but not ſufficiently thick to deſerve the name of *poſt-ſtone,* which our author thinks they do not, unleſs they are above three or four feet. Theſe thin ſtrata of free ſtone are very numerous in coal fields, and very frequently form the roofs of coal-ſeams. Some of them are three or four feet thick, while others do not exceed three or four inches. They make good roofs, eaſily cut through, and may be readily quarried out for other purpoſes.

8. *Grey-bands,* or grey-coloured free-ſtone, frequently form the roofs of coal ſeams. A great number of them are generally arranged in one place, lying immediately above one another; and they are frequently found of all degrees of thickneſs from one to twenty inches, though the moſt common dimenſions are from two to ſix. By the Scots colliers theſe are called *grey ſekes* as well as grey bands. Frequently they are found of moderate hardneſs, and ſufficiently ſtrong to make good flags and covers for ſewers. Theſe roofs are ſtrong and ſafe when the ſtone partakes of the nature of the coal, and has a black or blackiſh grey colour; but when they have a mixture of tilly or argillaceous matter, they are more friable.

9. *Blaes,* when hard, ſtrong, and well ſtratified, are reckoned tolerably good coal-roofs. Theſe are always of a bluiſh-black or black-grey colour, and are of great variety in reſpect to hardneſs and ſtrength. Some of the ſtrongeſt and hardeſt are either entirely black or greyiſh black; while ſome of the different ſhades of black are pretty thick, and others are but thin. The thickeſt, however, are not above 18 inches, and the thinneſt two or three inches or leſs. The medium thickneſs is from one foot to three or four inches. Some of them are ſufficiently hard to make a good and ſafe coal-roof; but they ſeldom acquire ſuch a degree of hardneſs as to give any conſiderable obſtruction in ſucking. All of them ſeem to have a conſiderable quantity of black argillaceous matter in their compoſition; and the ſtrong blaes have alſo a conſiderable quantity of ſand; often alſo containing a large portion of empyreumatic oil, and ſometimes have a conſiderable mixture of coaly matter. There is a great variety both in the thickneſs and quantity of theſe blaes found above ſeams of coal. In ſome places the thinneſt ſtrata make the immediate roof; in others, the thickeſt. Sometimes we find only five or ſix inches of blaes upon the coal; in others as many fathoms, or even much more; and it is common to find them of all the intermediate thickneſſes.

10. *Whin-ſ*

(b) We muſt obſerve, however, that according to Bergman and other eminent mineralogiſts, the cockles or ſhirls ought not to be confounded with baſaltes; which laſt name does not at all fit thoſe ſubſtances. See Volcanic Products in the Appendix to this article.

3. By its producing a liver of ſulphur, when mixed with a fixed alkali, like that made from artificial ſulphur. It is found,

a. Pellucid, of a deep yellow colour.

b. Opaque, white, and greyiſh.

Theſe are found in Siberia, at Bevieux in Swiſſerland, and at Solfatara near Naples.

c. Cryſtalliſed in octoedral priſms, with blunted points.

d. Tranſparent. Mr Davila had been informed that this was brought from Normandy in France. *(Brun.)*

1. Native ſulphur is found in different forms, *viz.* either in ſolid pieces of indeterminate figure, running in veins through rocks; or in ſmall lumps, in gypſum and limeſtones; in conſiderable quantities at Solfatara, and in the neighbourhood of volcanoes; or cryſtalliſed in pale, tranſparent, or ſemitranſparent, octogonal, or rhomboidal cryſtals, in the cavities of quartz; and particularly in the matrices of ores; or in the form of ſmall needles over hot ſprings, or near volcanoes *(Kirwan).*

Some-

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10. *Whitiſh and aſh-coloured argillaceous ſtrata,* of middling ſtrength, are frequently found to be the immediate roofs of coal. Some of theſe are of middling thickneſs, others thin. They are commonly found from two inches to two feet in thickneſs. A great many of theſe roofs are very dangerous on account of their fragility; while others are quite ſafe, owing to the more perfect formation of their ſtrata, or to ſome ingredient in their compoſition.

11. *Streaked roofs.* Theſe are of two ſorts: 1. Such as are compoſed chiefly of ſand, with a very ſmall mixture of clay and blaes; and, 2. Thoſe compoſed principally of clay or blaes with a ſmall quantity of ſand. Some of theſe have large, others ſmall, ſtreaks or ribs. Mr Williams ſays that he has ſeen them ſo beautifully ſtreaked as to reſemble the fineſt ſtriped cotton ſtuffs. Theſe ſtripes or ſtreaks always lie exactly parallel to one another, as well as to the bed of the ſtone, and are always ſpread out the whole breadth of the ſtratum. Their colours are various in different ſtrata, ſome of the ſtripes being nearly black and white, others white and red, and others yellow and red. In ſome the ſtripes appear of a lighter and darker grey colour. Some of the finely ſtriped ſtones have their ſtreaks about a quarter of an inch in diameter; ſometimes leſs: and it is common to ſee ſtripes from a quarter to three quarters of an inch broad; but in the finely ſtriped ſtones it is rare to find them a full inch thick without ſome different ſhade on one ſide or other of the ſtripe. The ſecond kind of theſe ſtreaked roofs, viz. ſuch as are compoſed of blaes, with a ſmaller mixture of ſand, differ but little from the former; only the colours are not always ſo bright, nor the ſtripes ſo fine; neither is the roof quite ſo hard.

12. *The ſoft blae roofs* ſometimes conſiſt of pretty thick ſtrata; others of ſuch as are thin or of middling thickneſs. There are likewiſe arrangements or claſſes of regularly ſtratified blaes, found immediately above ſeams of coal, from three or four inches to ſeveral fathoms in thickneſs, though ſome are even met with little exceeding one inch in thickneſs; though in the ſame place there might be a conſiderable thickneſs of blaes above the coal, taking in all the different ſtrata, thick and thin, which lay above it. Some of theſe roofs have an oily appearance on the outſide, and through all the fiſſures and joints of the ſtrata; that is, they appear ſmooth and gloſſy, and are very ſlippery to the touch. Others have no appearance of this kind; but all of them are tender, weak, and fragile, ſo that they make a very indifferent and dangerous roof.

13. Another kind of coal-roof conſiſts likewiſe of *blaes,* but ſuch as are *imperfectly ſtratified.* It is altogether the ſame in quality and colour as the laſt, the only difference that can be diſtinguiſhed being in the different degrees of ſtratification. The beds of this kind are not perfect, but unequal; whence it is a bad and dangerous roof, as great pieces of it are frequently apt to fall down by reaſon of the inequality and different joints of the ſtrata. Some of theſe blaes appear in thick, and others in thin or middling thick beds: while ſome have an oily ſmoothneſs, called by the Scots colliers *creeſhy* (greaſy) *blaes.* It is owing to this oilineſs particularly that theſe kinds of roofs are ſo dangerous; for the oil pervades the joints, and, rendering them ſlippery, makes the pieces more apt to fall out as ſoon as the coal is worked away from below them. Some of theſe have ſuch a quantity of natural oil, that they will flame a little in the fire; and in ſome places there are hard blaes which will burn when fire is ſet to them, though they will not conſume. At Pitfirran in Fifeſhire there is a ſpecies of theſe blaes ſo inflammable, that when fire is ſet to one corner of a hillock it will burn throughout the whole; nevertheleſs it is not reduced in bulk by this combuſtion, nor does it produce any aſhes. Inſtead of this it becomes conſiderably harder than before, and acquires a pale red colour. By reaſon of its hardneſs, it is proper for being laid upon horſe and foot paths, but is not ſo for roads over which heavy wheel-carriages paſs.

14. *Soft blaes not ſtratified at all.* Of theſe there is no more than one bed from two or three inches to ſeveral fathoms in thickneſs, without any others either above or below it. They are as common as any above the coal ſeams; but their ſubſtance is not always uniform throughout the whole ſtratum. Some of them are found divided into ſmall angular maſſes, and others into larger ones; but whether theſe are uniform or not, they always make a bad and dangerous roof. Theſe argillaceous ſtrata are ſometimes called *beds of till;* the uniform ſort are called *dauk,* and the glebous kind *lipey* blaes, by the Scots colliers. Both the uniform and glebous ſoft blaes frequently contain a quantity of ball iron-ſtone, though ſome of it contains none at all. The regular continuous ſtrata of iron-ſtone are commonly found in ſtratified ſoft blaes. There is a variety of ſoft coal roofs of a grey colour, and of which ſome are regularly ſtratified, and ſome not.

15. Re-

Inflammables.

Sometimes it is formed in old privies: of this Mr Magellan ſaw ſome lumps that were found in a very old one at Paris.

2. United with clay in the aluminous ore of La Tolfa, and alſo at Tarnowitz in Sileſia. This laſt reſembles a light grey earth: when dry, burſts or cracks in the water like marle; and poſſeſſes a ſtrong peculiar ſmell like camphor. If diſtilled, the ſulphur ſublimes. One hundred parts of this earth afford eight of ſulphur, beſides gypſum and a quantity of iron.

3. Mixed with clay, iron, and ſelenite. This compound is of a grey, brown, or black colour, found near Rome, Auvergne, Spain, and Iceland.

Inflammables.

4. With limeſtone in the form of a calcareous hepar. This is found at Tivoli, near Rome, and elſewhere in Italy. It is ſometimes diſſolved in mineral waters, three pounds of which contain as much as 25 grains of ſulphur. It often forms incruſtations on the brinks of theſe ſprings.

5. In the form of an alkaline hepar. This is ſaid to be found in ſome waters in Ruſſia; as will be hereafter noticed.

6. United to iron and clay of pyrites, &c. of which hereafter.

7. United to metallic ſubſtances, as hereafter ſpecified.

B. Saturated with metals (F).

1. With iron. Pyrites, or copperas-ſtone; *Pyrites.*

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15. *Regularly ſoft grey coal-roofs.*—Of theſe there are ſeveral ſorts. Some have a conſiderable quantity of ſand in the compoſition of the ſtrata; and many of theſe are as regularly ſtratified as any coal-metals whatever. Numbers are found very thin, and others of middling thickneſs; though in all caſes they are ſo tender and friable, that they make very bad and dangerous roofs. Some of them indeed look pretty well at firſt; but they ſoon crumble and come down, eſpecially when they have been expoſed to the air. This, in the opinion of Mr Williams, is owing partly to their having too much clay in their compoſition, and partly to the want of a ſufficient quantity of natural cement to connect the ſeveral particles of the ſtone together.

16. *Soft grey regular ſtrata,* or grey bands of an argillaceous kind; and of theſe there is likewiſe a conſiderable variety. Some are of a dark, others of a lighter grey; ſome thick, others thin: they are very numerous in coal-fields, and are frequently to be found as the immediate roofs of coal. Theſe, as well as the black kinds, are found in all quantities or degrees of thickneſs above different coals, from a few inches up to ſeveral fathoms; but whether they be in great or ſmall quantity, the roof they compoſe is generally very frail and tender.

17. *Soft grey argillaceous bands, imperfectly ſtratified.* Theſe differ little or nothing in ſubſtance from the former; the only difference is in the ſtratification. Many of the ſtrata of the former are of a middling thickneſs, or rather thin, finely and regularly ſpread out, and every part of each ſtratum of an equal thickneſs. But this ſort, though it has the appearance of ſtrata, is clumſy and irregular; that is, the ſeveral beds are unequal, and divided by many irregular joints into unequal miſhapen maſſes, which makes this a very bad roof; the maſſes being apt to ſeparate at the joints, and to fall down when the coal is worked out from below them.

18. *Soft grey argillaceous beds* of metal or coal roofs *not ſtratified at all.* Theſe are of two kinds, viz. 1. ſuch as are found broken or formed in the ſtratum into glebes or maſſes; and, 2. ſuch as are found in one uniform maſs throughout the whole bed, without any diviſion into maſſes or ſtrata. Theſe grey ſoft roofs are of all degrees of thickneſs, from a few inches up to many fathoms, as well as the black; and there is but very little difference between them in any reſpect excepting the colour. But in this, as well as in the black unſtratified blaes, and that both in the glebous and uniform beds, ball or glebous iron-ſtone is frequently found; and ſtrata of iron-ſtone are alſo found in the ſtratified ſoft grey blaes.

19. *White and aſh-coloured ſoft argillaceous coal roofs;* and of theſe there is alſo a great variety. Some of this kind are regularly ſtratified, others imperfectly, and ſome not at all. Some of the whitiſh argillaceous roofs are compounded of gritty ſand and clay; others appear to be chiefly compoſed of pure clay; and ſome of a loamy clay. Thoſe which are regularly ſtratified and mixed with ſand, either coarſe or fine, are of great variety with regard to thickneſs and the arrangements of the ſtrata; but all of them are tender and fragile, and thus make very troubleſome and dangerous roofs.

20. *Whitiſh argillaceous roofs, ſtratified,* and of a homogeneous quality, or not mixed with ſand. Some of theſe are finely and perfectly ſtratified, and are of different degrees of hardneſs; but in general, make but a weak roof. Some of them are found in irregular ſtrata, with all the other varieties and imperfections already mentioned.

21. *White and aſh-coloured argillaceous coal-roofs,* not *ſtratified at all.* Sometimes theſe are found in very thick beds in the coal-fields; and ſome of theſe, as well as of the black ſoft roofs, riſe in glebes and maſſes of different ſizes; while others are homogeneous throughout the whole bed, however thick, from two or three inches to ſeveral fathoms. Some of theſe beds of white argillaceous marle-like matter are found to be a ſandy or loamy clay; others a pure homogeneous clay, which does not feel gritty between the fingers nor in the mouth. The ſhades and varieties of this kind are as numerous as thoſe of any of the foregoing; and all of them, by the Scots colliers, are called *dauk,* whatever be their colour. Mr Williams informs us, that he has frequently taken ſome of theſe fine white clays to waſh his hands, and has found them anſwer almoſt as well as ſoap.

(F) Sulphur is the moſt common mineraliſer of metals; and therefore moſt of its combinations with theſe ſubſtances fall to be ranked hereafter among the metallic ores.

rites. This is the ſubſtance from which moſt ſulphur is prepared, and is therefore ranked here with all its varieties. It is hard, and of a metallic ſhining colour.

A. Pale yellow pyrites; *Pyrites ſubflavus.* Marcaſite. This is very common, and contains a proportionable quantity of ſulphur with reſpect to the iron; when once thoroughly inflamed, it burns by itſelf.

- *a.* Of a compact texture; *Polita piedra del ynca, Hiſpanorum.*
- *b.* Steel-grained.
- *c.* Coarſe-grained.
- *d.* Cryſtalliſed. It ſhoots moſtly into cubical and octoedral figures, though it alſo cryſtalliſes into innumerable other forms.

B. Liver-coloured marcaſite. Its colour cannot be deſcribed, being betwixt that of the preceding marcaſite and the azure copper ore. The iron prevails in this kind; it is therefore leſs fit to have ſulphur extracted from it, and alſo for the ſmelting of copper ores. It is found,

- *a.* Of a compact texture.
- *b.* Steel-grained.
- *c.* Coarſe-grained.

C. Variouſly combined with iron and other metallic ſubſtances.

1. With iron and copper; forming yellow or marcaſitical copper ore.
2. With iron, ſilver, and lead; potters lead ore.
3. With iron and zinc; mock lead, black jack or blende.
4. With iron and arſenic; arſenical pyrites.
5. With iron and cobalt.
6. With iron and biſmuth.
7. With iron and nickel.
8. With iron and gold; pyritical gold ore.
9. With ſilver; glaſs ſilver ore.
10. With copper; grey or vitreous copper ore.
11. With lead; potters lead ore.
12. With biſmuth.
13. With quickſilver; cinnabar.
14. With arſenic; orpiment, realgar.

XI. Mineral phlogiſton mixed with metallic earths.

This is not found in any great quantity: in regard to its external appearance, it reſembles pit-coal; and the fat ſubſtance contained in it, at times, partly burns to coal, and partly volatiliſes in a calcining heat.

The only known varieties of this kind are,

A. Minera cupri phlogiſtica.

When it has been inflamed, it retains the fire, and at laſt burns to aſhes, out of which pure copper can be ſmelted.

B. Minera ferri phlogiſtica.

This is not very different in its appearance from the pit coal or foſſile pitch, but it is ſomewhat harder to the touch. There are two varieties of this ſpecies:

1. Fixt in the fire; *Minera ferri phlogiſtica fixa.*

Expoſed to a calcining heat, it burns with a very languid though quick flame; it preſerves its bulk, and loſes only a little of its weight. It yields above 30 per cent. of iron.

- *a.* Solid, which reſembles black ſealing-wax.
- *b.* Cracked, and friable.

2. Volatile in the fire.

This is unalterable in an open fire, either of charcoal, or even upon a piece of charcoal before the flame of the blow-pipe; but under a muffle the greateſt part of it volatiliſes, ſo that only a ſmall quantity of calx of iron remains. It is found,

- *a.* Solid.
- *b.* Cracked.

This laſt kind leaves more aſhes: theſe aſhes, when farther expoſed to the fire, become firſt yellowiſh-green, and afterwards reddiſh-brown; when, beſides iron, they then alſo diſcover ſome marks of copper: it has, however, not been poſſible to extract any metallic ſubſtance from them, the effects of the loadſtone, and the colour communicated to the glaſs of borax, having only given occaſion to this ſuſpicion.

CLASS IV. METALLIC SUBSTANCES.

METALS are thoſe minerals which, with reſpect to their volume, are the heavieſt of all known bodies. Some of them are malleable; and ſome may be decompounded; and, in a melting heat (G), be brought back again to their former ſtate by the addition of the phlogiſton they had loſt in their decompoſition. See METALLURGY, Part I. Sect. i. and CHEMISTRY-*Index* at *Metallic Calces* and *Metals.*

All the metallic ſubſtances contain phlogiſton; and when, to a certain degree, deprived of it, fall into a powder like an earth; but their attractions for phlogiſton are different.

Moſt of them, when melted in a common way, and expoſed to the air, have an earthy cruſt formed upon the ſurface, which cannot again be reduced to metal without the addition of ſome inflammable matter. The baſe metals have this property.

But the noble metals, *viz.* platina, gold, and ſilver, are ſo firmly united to the phlogiſton, that they never calcine under fuſion, however long continued; and, after being changed into a calx in the liquid way, when melted in the fire, they reaſſume their metallic form without any other phlogiſton than what is contained in the matter of heat.

Quick-

(G) The various degrees of heat required to reduce metals to a fluid ſtate, are ſeen in the following table, which was extracted, for the moſt part, by Dr Withering, from the printed treatiſes of the late celebrated Profeſſor Bergman. It exhibits, in a ſimple view, 1. The ſpecific gravity of each metal; 2. The degree of heat by Fahrenheit's ſcale, in which it melts; 3. The quantity of phlogiſton it requires for its ſaturation; and

4. Its

Quickſilver holds a kind of middle place: for, like the baſe metals, it may be calcined, though not readily; and, like the noble ones, it may be reduced by heat alone.

We may therefore reckon four noble or perfect metals; *viz.* gold, platina, ſilver, and mercury; becauſe, when calcined, they recover their phlogiſton without the addition of any phlogiſtic ſubſtance.

But as tin, lead, copper, and iron, cannot be reduced without ſuch addition, theſe are called *ignoble* and *imperfect* or *baſe metals.* *Kirwan's Mineralogy.*

However, all thoſe eight metals (even mercury, when ſolid) are malleable to a conſiderable degree, and are called *entire metals.* But

Biſmuth, zinc, antimony, arſenic, cobalt, nickel, mangameſe, molybdena, and wolfram, are ſcarce at all malleable, and hence they are called *ſemimetals.* Nevertheleſs, zinc and purified nickel are more malleable than any of the other ſemimetals; ſo that we have four perfect or noble metals, four imperfect or baſe, eight entire, and nine ſemimetals (H).

Order

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4. Its attraction to the ſame ſaturating phlogiſton. We muſt, however, obſerve, that if the ſecond column be compared with that of Wedgwood's thermometer, their great diſagreements betray ſome fundamental error in the aſſumed data: for the degrees of heat aſſigned by Mr Wedgwood for melting gold, ſilver, and copper, are more than quadruple of thoſe aſſigned by Bergman, and that for melting iron is more than eleven times greater; although they both nearly agree in the red heat of iron, which Bergman ſays to be 1050 degrees, and Wedgwood 1077. Mr Magellan is of opinion, that the fault lies in Mortimer's thermometer, which Bergman quotes with ſome diffidence (Sect. 197. of his *Sciagraphia)*; and thinks it probable, that the changes cauſed by heat, on this metallic thermometer, are in a much leſs increaſing proportion by intenſe fire, than thoſe indicated by the contradiction of the pure clay, happily employed by Wedgwood in his thermometer. He therefore added another column to this table, marked *Wedgw.* with the degrees of the melting heats already aſcertained by this laſt thermometer, as being the neareſt to truth.

Metals.		Specific Gravity.	Melting Heat.	Melting Heat.	Saturating Phlogiſton.	Attraction to ſaturating Phlogiſton.
			Berg.	*Wedgw.*		
Gold - -		19,640	1301	5237	394	1 or 2
Platina - -		21,000			756	1 or 2
Silver - -		10,552	1000	4717	100	3
Quickſilver -		14,110	—40	—40	74	4
Lead - -		11,352	595		43	10
Copper -		8,876	1450	4587	312	8
Iron - -		7,800	1601	17977	342	11
Tin - -		7,264	415		114	9
Biſmuth - -		9,670	494		57	7
Nickel	common	7,000	1301		156	11
	pure	9,000	1601		109	5
Arſenic - -		8,308				
Cobalt	common	7,700	1450			
	pure		1601			
Zinc - -		6,862	699		182	11
Antimony -		6,860	809		120	6
Mangameſe -		6,850	Very great		227	11

N. B. By ſaturating phlogiſton, Profeſſor Bergman means to expreſs the proportionate quantities taken away from each metallic ſubſtance, when diſſolved by means of acids, and of courſe reduced to a calciform ſtate. The laſt column only expreſſes their attraction to this part of their phlogiſton, not to that which ſtill remains united to them in a calciform ſtate. *Withering.*

(H) Mr Mongez remarks, that the following are the general properties of metals, when conſidered as phyſical bodies; *viz.* their opacity, great ſpecific gravity, ductility, tenacity, cryſtallization, flavour, and even ſmell, at leaſt in ſome of them.

It is from their denſity that their gravity and opacity proceed; this laſt being ſuch, that, even reduced to the thinneſt plates, no rays of light can paſs through their particles, unleſs there remains an interſtice or pore quite free from the metallic ſubſtance. Gold leaf muſt, however, be excepted, which exhibits a fine green by tranſmitted light.

As to their cryſtallization, it has been found to take place whenever they are pure, and left to cool very ſlowly by themſelves, after having been perfectly fuſed. (See *Journal de Phyſique* for July 1781, p. 74) The flavour and ſmell abovementioned are very perceptible in the reguline ſubſtances of arſenic and antimony, as well as in lead, copper, and iron.

All metals are conductors of electricity; and more perfectly ſo than any other bodies during their union with phlogiſton.

They

Order I. Noble or Perfect Metals.

I. Gold; *Aurum ſol chymicorum.* See the articles Gold; alſo Chemistry-*Index;* and Metallurgy, Part II. ſect. 1.

This is eſteemed the principal and firſt among the metals; and that partly for its ſcarcity, but chiefly for the following qualities:

1. It is of a yellow ſhining colour.
2. It is the heavieſt of all known bodies, its ſpecific gravity to water being as 19,640 to 1000.
3. It is the moſt tough and ductile of all metals; becauſe one grain of it may be ſtretched out ſo as to cover a ſilver wire of the length of 98 yards, by which means $\frac{1}{7056000}$ of a grain becomes viſible to the naked eye.
4. Its ſoftneſs comes neareſt to that of lead, and conſequently it is but very little elaſtic.
5. It is fixed and unalterable in air and water, and is indeſtructible by the common action of fire.
6. When melted, it reflects a bluiſh-green colour from its ſurface.
7. It diſſolves in aqua-regia, in the dephlogiſticated marine acid, and alſo (according to Creil ‡) in an acid obtained by diſtilling vitriolic acid from off manganeſe.
8. When mixed with a volatile alkali and a little of the acid of nitre, by means of precipitation out of aqua-regia, it burns off quickly, in the leaſt degree of heat, with a ſtrong fulmination.
9. It is diſſolved, in *forma ſicca*, by the liver of ſulphur, and alſo ſomewhat by the glaſs of biſmuth (I).
10. It is not carried away by the antimony during the volatiliſation of that ſemi-metal, and is therefore conveniently ſeparated from other metals by the help of crude antimony; in which proceſs the other metals are partly made volatile, and fly off with the antimony, and partly unite with the ſulphur, to which the gold has no attraction, unleſs by means of ſome uniting body, or by a long digeſtion (K).

[‡] Journal de Phyſique, Oct. 1785, p. 297.

They are ſoluble either in nitrous acid and in dephlogiſticated marine acid, or in aqua-regia; and are precipitable in ſome degree by cauſtic alkalies; and except platina by the Pruſſian alkali.

When dephlogiſticated, they communicate a tinge to borax and to microcoſmic ſalt, or at leaſt render them opaque.

They aſſume a convex ſurface when melted, and even a globular form, if in a ſmall quantity; and though they mix for the moſt part with one another whilſt fuſed, yet they refuſe to unite with unmetallic ſubſtances, even their own calces, iron only excepted, which does to its own calx ſlightly dephlogiſticated and to plumbago. Nickel alſo, and ſome others, may contain ſulphur in their reguline ſtate.

Metals, when calcined, are capable of uniting with other calces and ſalts.

Three of the metallic calces have been found to be of an acid nature; *viz.* the arſenical, molybdenic, and tungſtenic; from which, by analogy, the nature of other calces may be conjectured.

The phlogiſton contained in metals is in a pure ſtate; viz. without water and aerial acid, with which it is invariably accompanied in all other compounds except acid airs and ſulphur.

When metallic ſubſtances are naturally found in the earth united to their full ſhare of phlogiſton, and conſequently poſſeſſing their peculiar properties, they are called *native.*

But when they are found more or leſs deprived of their phlogiſton and of their properties, combined with other ſubſtances, they are then called *mineraliſed.* This is the moſt common ſtate of the mineral kingdom. The ſubſtance ſo combined with them is called the *mineraliſer*, and the whole is called *ore;* by which name are alſo diſtinguiſhed theſe earths and ſtones in which metallic ſubſtances are contained.

But if both metallic ſubſtances are mixed together in their metallic or reguline form, without the loſs of phlogiſton, they are then ſaid to be alloyed.

When the mineraliſer is of a ſaline nature, and renders the metallic combination ſoluble in leſs than 20 times its weight of water, the compound is ranged among ſalts. Thus the vitriols of iron, copper, and zinc, are rather claſſed with ſalts than with ores.

The moſt common mineraliſers are, ſulphur, arſenic, and fixed air or aerial acid. The leaſt common are the vitriolic and the marine acids. The phoſphoric has been found only in two inſtances; *viz.* united to lead, diſcovered by Gahn; and to iron, in the ſiderite, as Mr Meyer believes.

Thoſe metallic ſubſtances, mineraliſed by aerial acid, are called *calciform ores.*

M. Magellan obſerves, that if the new doctrine of the French chemiſts, who aſſert, that calces of metals are a compound of dephlogiſticated or vital air with the metallic ſubſtance, were juſt, all calciform ores ſhould produce this vital air inſtead of aerial acid, when they are reduced to their metallic form; which is not the caſe; neither ſhould all the baſe metals and ſemimetals abſolutely require the mixture of ſome phlogiſtic ſubſtance in order to their being reduced from the ſtate of calces to their metallic form, which otherwiſe would be quite uſeleſs, if their reduction ſimply conſiſted in their ſeparation from the vital or dephlogiſticated air.

(I) Neither ſulphur nor fixed alkali, has any action on gold; but the liver of ſulphur, which is a compound of both, can diſſolve it in the dry way; ſo that if a proper quantity of gold-leaves be put in a crucible together with liver of ſulphur, and it be melted in a briſk fire, the gold is thoroughly diſſolved; and if the whole be diluted in water, the gold will be kept in the ſolution, and even paſs through the filtre along with it.

(K) Antimony is uſed alſo to refine gold from its alloy, as it attenuates and carries off all other metallic

Perfect Metals. Gold.

11. The phoſphorus is ſaid to have ingreſs into gold (L).

12. If mixed with a leſs portion of ſilver, platina, copper, iron, and zinc, it preſerves tolerably well its ductility. But,

13. When mixed with tin, it becomes very brittle; and it attracts likewiſe the ſmoke of that metal, ſo as to be ſpoiled if melted on an hearth where tin has been lately melted (M).

14. It requires a ſtrong heat before it melts, nearly as much or a little more than copper.

15. It mixes or amalgamates readily with quickſilver. See Metallurgy, Part II. ſect. 1. (N).

16. It is not diſſolved by the glaſs of lead, and therefore remains on the cupel.

A. Native gold. With reſpect to the figure or the quantity in which gold is found in one place, it is by miners divided into,

1. Thin ſuperficial plated or leaved gold; which conſiſts of very thin plates or leaves, like paper.
2. Solid or maſſive, is found in form of thick pieces.
3. Cryſtalliſed, conſiſts of an angular figure.
4. Waſh gold, or gold duſt, is waſhed out of ſands, wherein it lies in form of looſe grains and lumps (O). See other diſtinctions of form under the article Gold.

B. Mineraliſed gold. This is an ore in which the gold is ſo far mineraliſed, or ſo entangled in other bodies, as not to be diſſolved by the aqua-regia.

1. Mineraliſed with ſulphur by means of iron. Marcaſitical gold-ore; *Pyrites aureus.*
2. By means of quickſilver. It is found in Hungary.
3. By means of zinc and iron, or ſilver. The Schemnitz blende.

See other varieties of mineraliſed gold ores under the detached article Gold, already referred to.

Perfect Metals. Silver.

II. Silver: *Argentum, Luna.* See the article Silver. See alſo Chemistry-*Index*; and Metallurgy, Part II. ſect. iii. and Part III. ſect. iii.

This metal is,

a. Of a white ſhining colour.

b. Its ſpecific gravity to water is, according to Cronſtedt, as 11,091 to 1000; according to Bergman, = 10,552; and according to Kirwan, 11,095.

c. It is very tough or ductile, ſo that a grain of it may be ſtretched out to three yards in length and two inches in breadth.

d. It is unalterable in air, water, and fire.

e. It diſſolves in the acid of nitre, and alſo by boiling in the acid of vitriol.

f. If precipitated out of the acid nitre with the common ſalt, or with its acid, it unites ſo ſtrongly with this laſt acid, that it does not part from it, even in the fire itſelf, but melts with it into a maſs like glaſs, which is called *luna cornea* (P.)

ſubſtances mixed with it, without excepting the ſilver; whilſt lead leaves this laſt behind, and even adds ſome of its own to the gold. *Paucton*, p. 659.

(L) Gold, reduced into thin leaves, is not acted upon by the phoſphoric acid in the humid way, though the fire be urged till luminous decrepitations take place; but when it paſſes that point which ſeparates the humid from the dry way, Mr Margraaf obſerved that ſome purple ſcoria were formed, which is an indication that this concrete acid had partly calcined the gold during its fuſion. *Elements de Chymie de Dijon*, Vol. III. p. 131.

Beſides this, a drop of the phoſphoric acid on the ſolution of gold by aqua-regia precipitates the metal in its revived ſtate, as aſſerted by the academicians of Dijon. *Magellan.*

(M) The fumes of a ſingle grain of tin are capable of rendering hard eight ounces of gold; but it eaſily recovers its malleability by being melted on the fire. (*Wallerius* and *Bomare's* Mineralogy.) But when gold is mixed with arſenic, cobalt, nickel, biſmuth, or with the regulus of antimony, it only loſes great part of its malleability; and when in a certain proportion, it may be calcined and vitrified with them.—(*Fabroni.*)

(N) Bergman doubts if ever gold has been found perfectly pure; and Mr Kirwan ſays that it is very ſeldom found ſo, being generally alloyed with ſilver, copper, or iron, or all three. As to the gold commonly uſed in toys and other objects of luxury, every one knows that it is purpoſely debaſed by the artiſts with copper or other metals; and of late it has been employed in various pieces of jewellery, to form ornaments of various colours: thus a great alloy of ſilver (viz. one-third part), gives it a ſhade of a green colour; a ſimilar quantity of copper, a reddiſh one; a mixture of arſenic, or filings of ſteel, in the proportion of one-fourth part, gives it a bluiſh caſt; ſo that having the yellow naturally in the pure gold, and the white in pure ſilver, the jewellers have almoſt all the colours to diverſify their work. Even in the currency of money, there is none coined out of pure gold, which, by common agreement, is called *gold of 24 carats.* The gold coin of England, France, and Portugal, only contains 22 parts of pure gold, and two of alloy, viz. it is only 22 carats, in the common ſaying: that of Spain is but of $21\frac{10}{32}$ carats: but the ducat of Holland is of $23\frac{24}{32}$ carats; and the zecchino of Venice, of $23\frac{28}{32}$ carats: which laſt therefore, it would ſeem, is the pureſt gold coin of Europe. (*Paucton's Metrologie.*)

(O) M. Daubenton, in his Methodical Tables of Minerals, enumerates eight ſorts of native gold, viz. 1. In powder; 2. In grains; 3. In ſmall ſpangles; 4. In maſſes or lumps; 5. In filaments; 6. In branches like vegetables; 7. In lamella; and 8. In octoedral cryſtals.—He obſerves alſo, that gold, in its reguline ſtate, is formed, either, 1. Into angular cryſtals, compoſed of yellow octoedres; or, 2. Into irregular yellow maſſes, which, being broken, ſhow a granular ſubſtance.

(P) The marine acid attracts the calx of ſilver, but cannot remove its phlogiſton; and therefore cannot diſſolve *g*. It does not unite with the ſemi-metal nickel during the fuſion.

h. It amalgamates eaſily with quickſilver.

i. It is in the dry way diſſolved by the liver of ſulphur.

k. It has a ſtrong attraction to ſulphur, ſo as readily to take a reddiſh yellow or black colour when it is expoſed to liver vapours.

l. It has no attraction to arſenic; whence, when the red arſenical ſilver ore, or *rothgulden ertz* of the Germans, is put into the fire, the arſenic flies off, and leaves the ſulphur (which in this compound was the *medium unionis*,) behind, united with the ſilver in form of the glaſs ſilver ore, or glaſs ertz.

m. It is not diſſolved by the glaſs of lead, and conſequently it remains on the cupel.

n. It is exhaled or carried off by volatile metals and acids; as by the vapours of antimony, zinc, and the acid of common ſalt.

o. According to Cronſtedt, it melts more eaſily than copper; and this was a general opinion. But the contrary, as Mr Magellan remarks, has been proved by means of the nice thermometer lately invented by Wedgewood.—See Thermometer.

Silver is found,

A. Native or pure; which moſt generally is nearly of 16 carats ſtandard (q).

1. Thin, ſuperficial, plated or leaved.

2. In form,

  a. Of ſnaggs, and coarſe fibres.

  b. Of fine fibres. Capillary ſilver.

  c. Arboreſcent.

  d. Cryſtalline or figured. This is very rare: it has diſtinct fibres, with ſhining ſurfaces.

B. Mixed or alloyed with other metals.

The following are the known inſtances of theſe mixtures:

1. United to gold, (*Bergman's Sciagraphia*, § 154.)

2. Mixed with copper; (*Berg. Sc.* § 155.)

3. United to gold and copper; (*Berg. Sc.* § 156.)

4. Amalgamated with mercury, found in the mines of Salberg; (*Foſter's notes to Brunnich.*)

5. United to iron; (*Berg. Sc.* § 157.)

6. United to lead, ſometimes in ſuch quantities as to be worth the expences attending the ſeparation.

7. United to arſenic; (*Journal de Phyſique*, 1778, p. 50.)

8. United to antimony; (*Berg. Sc.* § 159.)

9. Joined to the regulus of arſenic and iron; (*Berg. Sc.* § 160.)

10. Mixed with the alkaline limeſtone from Annaberg, deſcribed by Mr Juſti; (*Brunnich.*)

11. Sandy ſilver-ore, without any metallic ſhining.

12. Silver-ore in a red-brown ſchiſtus, deſcribed by Lehman: it is compoſed of argillaceous earth, micaceous hematites, ſulphur, calcareous ſpar, fluor mineralis, lead, and ſilver.—It contains about ſeven or eight ounces of ſilver on the hundred weight.

13. Soft ſilver-ore. It is found among the marles and argillaceous earths; and is of various colours, either ſingly or mixed.

C. Diſſolved and mineraliſed.

(1.) With ſulphur alone. Glaſs ſilver ore.

This is ductile, and of the ſame colour as lead; but, however, becomes blacker in the air. It has therefore, though very improperly, got the name of *glaſs-ore;* for that name rather belongs to the *minera argenti cornea*, or horn ſilver ore, if indeed any ſilver ore can be conſidered as glaſſy.

It is found,

1. In cruſts, plates, or leaves.

2. Grown into

  a. Snaggs, and

  b. Cryſtalline figures.

  It is generally either of a lamellar or a grained texture.

The glaſs ſilver ore is the richeſt of all ſilver ores; ſince the ſulphur, which is united with the ſilver in this ore, makes but a very ſmall quantity of its weight

(2.) Arſenico-martial ſilver ore, *Weill ertz*, Germ.)

This ore contains ſilver and iron mineraliſed by arſenic; the arſenic in a larger proportion than the iron. This is the *Pyrites argenteus* of Henckel.

1. It is a hard ſubſtance, of a white ſhining appearance, and of a compact, lamellar, or fibrous texture. (*Kirwan*, ſp. 7.)

2. Of a yellowiſh white colour, and of a ſtriated ſtructure, reſembling biſmuth, but much harder. (*Kirwan*, ſp. 3.)—It is found near Guadanal canal in Spain.

3. Near the ſame place is found alſo another ore of the ſame kind, which is very ſoft and eaſily cut; and when cut, has a brilliant metallic appearance. It conſiſts of conchoidal laminæ. The quintal contains only from four to ſix ounces of ſilver; but it is eaſily reduced by evaporating the arſenic, which then leaves the ſilver ſlightly contaminated with iron. (*Kirwan*, ſp. 4.)

(3.) With

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diſſolve it in its metallic ſtate, (*Bergman.*) However, the marine acid, if well concentrated, or rather reduced into an aerial form, diſſolves ſilver in its metallic ſtate, (*Fabroni.*)

Mr Scheele, and after him Mr Bertholet, aſſert poſitively, that the marine acid, being dephlogiſticated by its diſtillation over manganeſe in the form of a yellow air or gas, diſſolves all the metals, without excepting gold, ſilver, or mercury. See Scheele's Eſſay 5. § 25. H.

The vitriolic acid being diſtilled alſo over the manganeſe, diſſolves ſilver, gold, and mercury, as Dr Crell aſſerts, (*Journal de Phyſique*, Oct. 1785, p. 297.)

Silver is precipitated from the vitriolic and nitrous acids by the marine; and from the nitrous, in great meaſure, by the vitriolic, (*Kirwan.*)

(q) Wallerius diſtinguiſhes ſeven ſpecies of ſilver: (ſee the article Silver). Daubenton reckons eight varieties of *native white ſilver*, ariſing from their peculiar forms.

(3.) With ſulphur and arſenic. The red or ruby-like ſilver ore. The *rothgulden* of the Germans.

The colour of this ore varies as the proportion of the ingredients varies in the mixture, viz. from dark grey to deep red; but when it is rubbed or pounded, it always gives a red colour.

a. Grey arſenical ſilver ore.

1. Plated, cruſted, or leaved.

2. Solid.

b. The red arſenical ſilver ore:

1. Plated cruſted, or leaved;

2. Solid or ſcaly.

3. Cryſtalliſed (R.)

In this laſt form it ſhows the moſt beautiful red colour, and is often ſemi-tranſparent. It contains about 60 *per cent.* in ſilver.

(4.) With ſulphur, little arſenic, and iron.—*Schwartz ertz Schwartz gulden, Silber mulm.* Germ.)

This is a friable, weathered, decayed ore.

a. Of a black or ſooty colour; and is therefore called by the Germans *ſilberſchwartz*, or *ruſſigtes-ertz*.

(5.) With ſulphurated arſenic and copper. The *weiſſgulden* of the Germans.

This, in its ſolid form, is of a light grey colour, and of a dull and ſteel-grained texture. Its proportion of ſilver is from 10 to 30 *per cent.*

(6) With ſulphurated arſenic and iron. The *weiſertz*, or white ſilver ore of the Germans.

This is an arſenical pyrites, which contains Silver; it occurs in the ſaxon mines, and ſo exactly reſembles the common arſenical pyrites, as not to be diſtinguiſhed from it by ſight alone, or without other means.

(7.) With ſulphurated antimony.

a. Of a dark grey and ſomewhat browniſh colour; the *laberetz* of the Germans.

b. Of a blackiſh blue colour.

1. In form of capillary cryſtals. *Federertz*, or plumoſe ſilver ore.

(8.) With iron, arſenic, and cobalt, mineraliſed by ſulphur.

This ore looks like the *weiſſgulden* deſcribed above; but is diſtinguiſhed by the roſe coloured particles of cobalt, diſperſed through dark brown, blackiſh, or grey, and ſometimes ſhining ſolid maſs. It is to this ſpecies of ores that the ſilver gooſe dung ore belongs.

(9.) With ſulphurated copper and antimony.—The Dal *fah-lertz*.

This reſembles both in colour and texture the dark-coloured weiſſgulden. When rubbed, it gives a red powder.

a. Solid.

b. Cryſtalliſed.

(10.) With ſulphurated zinc. The *pechblende* of the Germans.

This is a zinc ore, mock lead, or blende, which contains ſilver, and is found among rich ſilver and gold ores.

a. Of a metallic changeable colour.

1. Solid and with fine ſcales.

2. In form of balls. The *kugel-ertz*, or ball ore.

b. Black mock lead, or blende, found in Saxony. This is alſo found,

1. Solid, and with fine ſcales;

2. And in form of balls.

(11.) With ſulphurated lead; potters ore. *Galena; bleyglanz.*

(12.) With ſulphurated lead and antimony, called *ſtriperz.*

(13.) With ſulphurated iron. *Silberhalitgier kis*; marcaſite holding ſilver.

(14.) With ſulphurated and arſenical cobalt; dendrites being ſometimes found in the ſtone.

Theſe kinds keep well in water; but generally wither in the air, and loſe the ſilver they contain.

(15.) Mineraliſed by ſulphur, with regulus of antimony and barytes. The butter-milk ore.

This is found in the form of thin particles, on granular ſpar, (*Kirwan*, ſp. 13.)

(16.) Combuſtible ſilver ore.

This is a black and brittle ſubſtance, and leaves about 6 per cent. of ſilver in its aſhes. It is in fact a coal in which ſilver is found. (*Kirwan*, ſp. 14.)

(17.) With the acid of common ſalt. *Minera argenti cornea. Hornetz*, or horn-ſilver ore.

This is the ſcarceſt ſilver ore; it is of a white or pearl colour, changeable or varying on the ſurface, ſemi-tranſparent, and ſomewhat ductile both when crude and when melted. It cannot be decompoſed without ſome admixture of ſuch ſubſtances as attract the acid of ſea-ſalt.

III. Platina del Pinto; *Juan blanca*.

This metal is a recent diſcovery of our times; and is deſcribed with great accuracy by Scheffer, in the Acts of the Royal Academy of Sciences at Stockholm for the year 1752; as alſo by Dr Lewis, in the Philoſophical Tranſactions for the year 1754, vol. xlviii. and by many other writers. By theſe deſcriptions we are convinced of the reſemblance this metal bears to gold; and therefore we muſt allow it to be called *white gold*. It has, however, a variety of diſtinguiſhing qualities

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(R) Wallerius mentions the ſix following varieties of this notable ore in his *Species* 388, viz. 1. The red opaque, like cinnabar, from Andreaſberg in the Hartz, and from Salberg in Weſtmannia: 2. The bluiſh, from Freiberg and Annaberg: 3. The grey, from Freiberg and Andreaſberg: 4. The red tranſparent amorphous, of the garnet colour, from Potoſi and Ioachimſtal: 5. The red tranſparent, cryſtalliſed into priſmatic decaedres, or dodecaedres, from Hungary, Alſace, and the Duchy of Deux Ponts: 6. The only ſuperficially red ore, from Salberg and Ehrenfriederichſdorf.

lities beſides its colour, which aſcertain its peculiar nature: All which, with its hiſtory, uſes, &c. are particularly deſcribed under the detached article Platina. See alſo Chemistry-*Index*; and Metallurgy, Part II. Sect. ii.

1. It is of a white colour.
2. It is ſo refractory in the fire, that there is no degree of heat yet found by which it can be brought into fuſion by itſelf, the burning-glaſs excepted. But, when mixed with other metals and ſemimetals, it melts very eaſily, and eſpecially with arſenic, both in its metallic form and in form of a calx or glaſs.

IV. Quickſilver, mercury. *Hydrargyrum, Argentum vivum, Mercurius.* See the article Quicksilver; Chemistry-*Index*, at *Mercury*; and Metallurgy, Part II. ſect. viii.

Mercury diſtinguiſhes itſelf from all metals by the following qualities (s.)

a. Its colour is white and ſhining, little darker than that of ſilver.

b. It is fluid in the cold, and diviſible by the leaſt force; but, as it only ſticks to a few bodies to which it has an attraction, it is ſaid that it does not wet.

c. It is volatile in the fire.

d. It attracts the other ſemimetals and metals: and unites with them all except cobalt and nickel, with which it cannot by any means yet known be made to mix. This union is called *amalgamation*. This amalgamation, or mixtion of metallic bodies, according to the readineſs with which they unite or mix, is in the following progreſſion, viz. gold, ſilver, lead, tin, zinc, biſmuth, copper, iron, and the regulus of antimony; the three latter, however, do not very readily amalgamate. The iron requires a ſolution of the vitriol of iron, as a medium to promote the union.

e. It diſſolves in ſpirit of nitre, out of which it is precipitated by a volatile alkali, and common ſalt, in form of a white powder; but if a fixed alkali is uſed, a yellow powder or calx is obtained (T).

f. But

(s) It were almoſt ſuperfluous, ſays Mr Kirwan, to mention any other character of quickſilver than its liquidity, to diſtinguiſh it from other metals. In regard to this property, Bergman obſerves, that mercury conſtitutes one extreme among the metals, and platina the other; ſince it requires to be melted only ſuch a degree of heat as is rarely wanting in our atmoſphere, and boils at the 600 degrees nearly after lead melts. See the table at p. 111. *Note.* But when the cold is increaſed to the temperature denoted by 40 degrees below 0 both of Fahrenheit's and of the Swediſh thermometer, which both coincide in that point (ſince 212—32, or 180 : 100 :: 32+40, or 72 : 40), this metal concretes like any other metal, and becomes quite ſolid; (ſee Philoſophical Tranſactions for 1783, p. 303.) Mercury in its common ſtate, therefore, according to Bergman (Treatiſe of *Elect. Attract.*), is to be conſidered as a metal in fuſion; and ſince in its ſolid ſtate it is nearly as malleable as lead, it by no means ought to be placed among the ſemimetals, otherwiſe every other entire metal ſhould be conſidered as brittle, for none is malleable when in fuſion.

(T) 1. Mercury is diſſolved with great rapidity by nitrous acid: the liquor is of a greeniſh-blue colour, but loſes it afterwards and becomes limpid. This ſolution, when made without heat, is uſed as a teſt for the analyſis of mineral waters, and has different properties from that made with the help of heat. In the firſt caſe, ſays Bergman, very little phlogiſton is loſt, and the ſalt eaſily cryſtalliſes, being white and ſcarcely acrid. It is not precipitated by diſtilled water; but by cauſtic vegetable alkali, it is precipitated of a yellowiſh colour; by mild alkali, the precipitation is white; by mineral alkali, it is yellow, but it ſoon grows alſo white; by volatile alkali, it turns to a greyiſh-black colour; by Glauber's ſalt or by pure vitriolic acid, the precipitation is white, granulated, and in a ſmall quantity; nor, if this precipitant has been ſparingly uſed, does this colour appear in leſs than an hour; by muriatic acid, or common ſalt, the precipitation is alſo white, but in a large quantity, and in curdles.

2. But if the mercurial ſolution be put over a ſand-heat, it may be charged with a quantity of mercury equal almoſt to its weight. According to the chemiſts of Dijon, 10 ounces of nitrous acid may diſſolve eight of mercury. The action of the ſolvent becomes ſtronger with the heat; emits great quantity of vapours; and if not taken from the fire, will be too far evaporated. Diſtilled water will precipitate from this ſolution a white calx, becauſe it is more dephlogiſticated, and the ſolvent is overcharged with it; and the water changing the denſity of the liquor, diminiſhes the adheſion of the calx, as Fourcroy remarks. This white calx will turn yellow, if boiling water be poured on it, The vegetable alkali precipitates it of a browniſh yellow, which by degrees aſſumes a pale yellow tinge: the mild vegetable, and the mineral alkalies, produce nearly the ſame colour; though when this laſt is employed, the colour turns afterwards to white. The precipitation by volatile alkali is quite white alſo; that by the vitriolic acid is yellow; and finally, a copious, white mucilaginous matter is the precipitate by the marine acid.

3. This ſolution by nitrous acid is very cauſtic; corrodes and deſtroys animal ſubſtances; when it falls on the ſkin, ſtains it of a deep purple brown colour, which appears black: the ſtains do not go off before the ſeparation of the epidermis, which falls away in ſcales or a kind of ſcars. It is uſed in ſurgery as a powerful eſcharotic, and is called *mercurial water*.

4. The ſame ſolution, by cooling, is ſuſceptible of forming cryſtals, which vary from one another according to circumſtances: for the moſt part they are like needles; are very cauſtic; redden the ſkin; and detonate when put on burning coals, provided they be dry. They are called *mercurial nitre*, which fuſes when heated in a crucible; exhales reddiſh fumes; aſſumes a deep yellow colour, which afterwards turns to orange, and

f. But it requires a boiling heat to diſſolve it in oil of vitriol (u).

g. It is not affected by the acid of common ſalt, unleſs it be previouſly diſſolved by other acids (v); in which caſe only they both unite with one another, and may be ſublimed together; this ſublimate is a ſtrong poiſon.

h. It unites with ſulphur by grinding; and then produces a black powder called *æthiops mineralis* (w), which ſublimes into a red ſtriated body called *factitious cinnabar.*

i. The ſulphur is again ſeparated from the quickſilver, by adding iron or lime, to which the ſulphur attaches itſelf, leaving the quickſilver to be diſtilled over in a metallic form; but if a fixed alkali be uſed, ſome part of the quickſilver will remain diſſolved in the reſiduum, which is a liver of ſulphur.

Quickſilver is found,

A. Native, or in a metallic ſtate. *Mercurius nativus,* or *virgineus.*

This is found in the quickſilver mines at Idra in Friuli, or the Lower Auſtria, in clay, or in a black ſlaty *lapis ollaris,* out of which it runs, either ſpontaneouſly, or by being warmed even in the hands.

B. United to gold or ſilver. *Hydrargyrum argento vel auro adunatum.*

Mr Kirwan aſſerts, on the authorities of Monet and Lin, Von Gmelin, that in Sweden and Germany mercury has been found united to ſilver in the form of a ſomewhat hard and brittle amalgam.

Romé de l'Iſle had a ſpecimen of this natural amalgam from Germany, which is imbedded in a quartzoſe maſs, and mixed with cinnabar, as Mr Mongez aſſerts; and he adds, that in the royal cabinet, at the king's garden at Paris, is depoſited another fine ſpecimen of this mercurial ore, which was found cryſtalliſed in the mine called *Carolina* at Muchel-lanſberg in the duchy of Deux Ponts. M. de l'Iſle ſpeaks alſo very poſitively of a ſpecimen of native gold from Hungary, which ſeems to be a natural amalgam of gold and mercury. It is compoſed of quadrangular priſms, of a greyiſh yellow colour, and of a brittle texture. This ſpecimen is alſo in the king's cabinet at the royal garden at Paris.

Mr Kirwan, ſpeaking of the method of examining the purity of gold by the moiſt way, ſuppoſes, with Sir Torbern Bergman, that there are natural amalgamations of mercury with gold and ſilver: and Neumann obſerves, that ſometimes a mineral, containing gold or ſilver, is met with among mercurial ores, although this is a great rarity.

It is evident, therefore, that there naturally exiſt

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and at laſt to a brilliant red: in this ſtate it is called *red precipitate,* or *arcanum corallinum.* It muſt be made in a matraſs with a gentle heat if it is deſigned to be corroſive for chirurgical purpoſes.

(u) 1. The vitriolic acid, concentrated and boiling hot, ſeizes on mercury, and preſently reduces it if urged by heat to a kind of white powder, which turns yellow by the affuſion of hot water, but does not diſſolve in it: this is called *turbith mineral:* but if cold water, inſtead of hot, was poured in the white maſs, the powder would not change its white colour into yellow as was ſaid above about the nitrous ſolution.

2. If Mercury be rarefied by heat into vapours, and theſe meet with thoſe of marine acid in the ſame ſtate, a corroſive ſublimate will be formed. This metallic ſalt ſhoots into cryſtals pointed like daggers, which are the ſtrongeſt of all poiſons. But there are various other proceſſes found in chemical authors to make this ſalt with more or leſs trouble. See Chemistry, n° 814—818.

3. If corroſive ſublimate be mixed with tin and diſtilled, a very ſmoking liquor is produced, called by the name of its inventor the *ſmoking liquor of Libavius.* See Chemistry, n° 810.

The muriatic acid in the ſublimate is not ſaturated, and from hence proceeds its great corroſive power; for if a freſh quantity of mercury be added to it, and ſublimed a ſecond or third time, a ſweet, or mixed ſublimate, called *mercurius dulcis,* is produced, which is not poiſonous, and is given internally as a purgative, or an emetic, according to the doſe. See Chemistry, n° 819.

(v) Muriatic acid does not act upon quickſilver unleſs this laſt be previouſly deprived of as much phlogiſton, as $\frac{74}{100}$ of the quantity contained in the hundred of ſilver, or of $\frac{80}{182}$ in the hundred of zinc. (See Bergman's *Sciagraphia,* and his treatiſe *De Phlogiſti quantitate.*)

(w) The academicians of Dijon ſay, that the true proportion to make this æthiops, is that of one part of brimſtone with four of mercury. Fourcroy directs only one of mercury, with three of flowers of ſulphur, to be triturated, till the mercury is extinguiſhed. A black powder is then produced, which is the æthiops mineral. The combination is better effected when the mercury is mixed with the fuſed ſulphur: by agitating this mixture, it becomes black, and eaſily takes fire; it ſhould be then taken from the fire, and the flame ſhould be extinguiſhed a little after, ſtirring the maſs till it becomes into ſolid clots. If this ſubſtance be expoſed to a great degree of heat, it takes fire, the ſulphur is conſumed, and a ſubſtance remains which is of a violet colour when pulveriſed. This powder being put into matraſſes, till their bottom become red by the force of fire, is ſublimed after ſome hours, and artificial cinnabar is found in the top of the veſſels cryſtalliſed into brown red needles.

Mercury, divided by means of a rapid and continual motion, as that of a mill-wheel, gradually changes itſelf into a very fine black powder, which is called *æthiops per ſe,* on account of its colour, in order to diſtinguiſh it from this *æthiops mineralis* mentioned in the text.

iſt various ores of quickſilver, amalgamated with ſilver, gold, and other minerals, although they be but ſeldom met with.

C. Mineraliſed,

[1.] With ſulphur.

A. Pure cinnabar, *Cinnabaris nativa.*

a. Looſe or friable cinnabar like red ochre.

b. Indurated or ſolid cinnabar. It is of a deep red colour; and, with reſpect to its texture, is either,

1. Steel-grained;
2. Radiated;
3. Compoſed of ſmall cubes, or ſcaly; or
4. Cryſtalliſed, in a cubical form; it is tranſparent, and deep red like a ruby.

B. Impure cinnabars.

(1.) A mercurial ore is found in Idria, ſays Gellert, where the mercury lies in an earth or ſtone, as if it were in a dead form; and has the appearance of a red-brown iron-ſtone; but it is much heavier than that. It contains from three quarters to ſeven eighths of the pureſt mercury; leaves, after diſtillation, a very black ſtrong earth behind; and gives ſome marks of cinnabar.

2.) Liver ore, which is moſt common in Idria, and has its name from its colour.—Outwardly it reſembles an indurated iron-clay; but its weight diſcovers that its contents are metallic. It yields ſometimes 80 pounds of quickſilver per hundred weight.

3. Burning ore; *brand-erz* in German. This ore may be lighted at the candle; and yields from nine to 50 pounds of quickſilver per hundred weight. *Brunnich.*

[2.] With iron by ſulphur. Pyritous cinnabar. Sir Torbern Bergman inſerted this ore in the 177th ſection of his *Sciagraphia*, and ſeems doubtful whether this be a diſtinct ſpecies from the cinnabar; as the iron is perhaps, ſays he, only mechanically diffuſed therein. Mr Mongez remarks, that there are but a few inſtances of cinnabar in which iron is not found in its calcined form; though, in the act of the ore being reduced, it paſſes to its metallic ſtate, and becomes capable of being acted on by the loadſtone.

Another pyritous ore of cinnabar was found at Menidot, near St Lo in Lower Normandy. It conſiſted in grains of different ſizes, of a red brown colour: they had a vitriolic taſte and ſulphureous ſmell. Found alſo at Almaden in Spain, and at Stahlberg in the Palatinate, though at this laſt place they are of a dodecaedral form.

[3.] With ſilver by the aerial acid, and ſulphur.

This ſeems to be a native precipitate *per ſe*, or calx of mercury. It is ſaid to have been lately found in Idria, in hard compact maſſes of a browniſh-red colour; ſee *Journal de Phyſique* for January 1784, p. 61. If this account can be relied upon, it will prove, that quickſilver, even in a calciform ſtate is naturally found mineraliſed with ſilver by means of ſulphur.

[4.] With ſulphur and copper.

This ore is blackiſh grey, of a glaſſy texture, and brittle; crackles and ſplits exceſſively in the fire; and when the quickſilver and ſulphur are evaporated, the copper is diſcovered by its common opaque red colour in the glaſs of borax, which, when farther forced in the fire, or diluted, becomes green and tranſparent. It is found at Muſchlanſberg in the duchy of Deux Ponts.

[5.] Mineraliſed by the marine and vitriolic acids.

Mineralogy owes the diſcovery of this ore to Mr Woulfe, who publiſhed an account of it in the Philoſophical Tranſactions for 1776. It was found in the duchy of Deux Ponts, at the mine diſtinguiſhed by the name of *Obermoſchal.* It had a ſpar-like appearance. This ore is either bright and white, or yellow or black. It was mixed with cinnabar in a ſtony matrix; and being well mixed with one-third of its weight of vegetable alkali, afforded cubic and octagonal cryſtals; that is, ſalt of Sylvius and vitriolated tartar.

The marine ſalt of this mercury is in the ſtate of ſublimate corroſive.

Order II. Imperfect or base Metals.

I. Tin. *Stannum; Jupiter.* (See the detached article Tin: Alſo Chemistry-*Index*; and Metallurgy, Part II. ſect. vi. and Part III. ſect. vi.)

This is diſtinguiſhed from the other metals by the following characters and qualities, It is,

a. Of a white colour, which verges more to the blue than that of ſilver.

b. It is the moſt fuſible of all metals; and,

c. The leaſt ductile; that is, it cannot be extended or hammered out ſo much as the others (x).

(x) Tin is ſufficiently ductile to be beaten into very thin leaves. But ductility and extenſibility are two different properties, leſs connected with one another than is generally imagined. Iron and ſteel are drawn into exquiſite fine wire, but cannot be beat into very thin leaves. Tin, on the other hand, is beat into fine leaves, and may be extended between rollers to a conſiderable ſurface. The tin-ſheet uſed in various arts, is commonly about $\frac{1}{766}$th part of an inch; but may be extended twice as much in its dimenſions without difficulty. Notwithſtanding this extenſibility, tin cannot be drawn into wire, on account of the weak coheſion of its particles. A tin wire, however, of one-tenth of an inch diameter, is able to ſupport a weight of $49\frac{1}{2}$ pounds, according to Fourcroy. Gold and ſilver poſſeſs both properties of ductility and extenſibility the moſt eminently of all metallic bodies; whilſt lead, notwithſtanding its flexibility and ſoftneſs, cannot be made either into leaves or wire of any fineneſs.

d. In breaking or bending, it makes a crackling noiſe.

e. It has a ſmell particular to itſelf, and which cannot be deſcribed.

f. In the fire it is eaſily calcined to white aſhes, which are 25 per cent. heavier than the metal itſelf. During this operation, the phlogiſton is ſeen to burn off in form of ſmall ſparkles among the aſhes or calx.

g. This calx is very refractory; but may, however, with a very ſtrong degree of heat be brought to a glaſs of the colour of colophony. But this calx is eaſily mixed in glaſs compoſitions, and makes with them the white enamel.

h. It unites with all metals and ſemimetals; but renders moſt of them very brittle, except lead, biſmuth, and zinc.

i. It amalgamates eaſily with quickſilver.

k. It diſſolves in aqua-regia, the ſpirit of ſea-ſalt, and the vitriolic acid; but is only corroded into a white powder by the ſpirit of nitre. The vegetable acid, ſoaps, and pure alkaline ſalts, alſo corrode this metal by degrees.

l. Its ſpecific gravity to water is as 7400 to 1000, or as 7321 to 1000.

m. Diſſolved in aqua-regia, which for this purpoſe ought to conſiſt of equal parts of the ſpirit of nitre and ſea-ſalt, it heightens the colour of the cochineal, and makes it deeper; for otherwiſe that dye would be violet.

(1.) Native Tin.

The exiſtence of native tin has long been queſtioned: but it has undoubtedly been found ſome years ago in Cornwall, as Mr Kirwan remarks.

1. Malleable tin, in a granular form, and alſo in a foliaceous ſhape, iſſuing out of a white hard matter like quartz: but which, after being properly aſſayed, proved to be arſenical cryſtals; a circumſtance that evinces its being native tin, ſince the arſenic could not remain in this form if the tin had been melted. It appeared like a thick, jagged, or ſcolloped lace or edging; and was found near St Auſtle in Cornwall.

2. In the form of cryſtalline metallic laminæ, or laminated cryſtals, riſing ſide by ſide out of an edging, which ſhone like melted tin: they were almoſt as thin as flakes or ſcales of talc, interſecting each other in various directions, with ſome cavities between them, within which appeared many ſpecks and granules of tin, that could be eaſily cut with a knife: this was alſo found in Cornwall.

3. In a maſſy form, more than one inch thick in ſome places, and incloſed in a kind of quartzous ſtone; or rather in an hard cruſt of cryſtalliſed arſenic.

(2.) Calciform Ores of Tin.

A. In form of a calx, *Stannum calciforme.*

A. Indurated, or vitrified.

1. Mixed with a ſmall portion of the calx of arſenic.

a. Solid tin ore, without any determinate figure. Tin-ſtone.

It reſembles a garnet of a blackiſh brown colour, but is much heavier; and has been conſidered at the Engliſh tin-mines as a ſtone containing no metal, until ſome years ago it began to be ſmelted to great advantage.

B. Cryſtalliſed.

a. Tin ſpar, or white tin ore. This is generally of a whitiſh or grey colour; ſometimes it is yellowiſh, ſemi-tranſparent, and cryſtalliſed, either of a pyramidical form, or irregularly.

b. Tin-grains. This ore, like the garnets, is of a ſpherical polygonal figure; but ſeems more unctuous on its ſurface.

1. In large grains.
2. In ſmall grains.

B. Mixed with metals.

1. With the calx of iron, as in the garnet.
2. With manganeſe. See the *Semimetals.*

C. Mineraliſed.

1. With ſulphur and iron.
2. With ſulphur. *Aurum muſivum.*

This was diſcovered by Profeſſor Bergman, among ſome minerals which he received from Siberia. He obſerved two ſorts of it, analogous to the two artificial combinations of tin with ſulphur.

1. One nearly of the colour of zinc, and of a fibrous texture, which contained about 20 *per cent.* of ſulphur, and the remainder tin.
2. The other enveloped the former like a cruſt; reſembled aurum muſivum; and contained about 40 *per cent.* of ſulphur, a ſmall proportion of copper, and the remainder tin. *Mem. Stockh.* for 1721, p. 328.

At Huel Rock, in St Agnes in Cornwall, there has been found a metallic vein, nine feet wide, at 20 yards beneath the ſurface. Mr Raſpe was the firſt who diſcovered this to be a ſulphurated tin-ore: it is very compact, of a bluiſh white colour, approaching to grey ſteel, and ſimilar to the colour of grey copper ore: it is lamellar in its texture, and very brittle. It conſiſts of ſulphur, tin, copper, and ſome iron. Mr Raſpe propoſes to call it *bell-metal ore.*

According to Mr Klaproth's analyſis of this ore, 119 grains contain 30 of pure ſulphur; 41 of tin; 43 of copper; two of iron; and three grains of the ſtony matrix. In another ſpecimen of the ſame ſulphurated tin-ore from Cornwall, there were in the hundred 25 parts of ſulphur, 34 of tin, 36 of copper, three of iron, and two of the ſtony matrix.

II. Lead; *Plumbum, Saturnus.* (See the article LEAD, and CHEMISTRY-*Index*: Alſo METALLURGY, Part II. ſect. v. and Part III. ſect. vii.)

The properties of lead are as follows.

a. It is of a bluiſh white colour when freſh broke, but ſoon dulls or ſullies in the air.

b. It is very heavy; viz. to water as 11,325 to 1000.

c. It is the ſofteſt metal next to gold; but it has no great tenacity, and is not in the leaſt ſonorous.

d. It is eaſily calcined; and by a certain art in managing the degrees of the fire, its calx becomes white, yellow, and red.

e. This calx melts eaſier than any other metallic calx to a glaſs, which becomes of a yellow colour, and ſemitranſparent. This glaſs brings other bodies, and the imperfect metals, into fuſion with it.

f. It diſſolves, 1ſt, In the ſpirit of nitre; 2dly, In a diluted oil of vitriol, by way of digeſtion; 3dly, In the vegetable acid; 4thly, In alkaline ſolutions; and 5thly, In expreſſed oils, both in the form of metal and of calx.

g. It gives a ſweet taſte to all ſolutions.

h. It amalgamates with quickſilver.

i. With the ſpirit of ſea-ſalt it has the ſame effect as ſilver, whereby is produced a *ſaturnus corneus*.

k. It does not unite with iron, when it is alone added to it in the fire.

l. It works on the cupel, which ſignifies that its glaſs enters into certain porous bodies, deſtitute of phlogiſton and alkaline ſalts.

m. It melts in the fire before it is made red-hot, almoſt as eaſily as the tin.

n. Its calx or glaſs may be reduced to its metallic ſtate by pot-aſhes.

[1.] Native Lead.

For proofs of lead being naturally found in its metallic ſtate, ſee the article Lead.—It may be here added, that Henckel likewiſe affirms its exiſtence, in his *Flora Saturniſans*; (ſee Kirwan's *Elements of Mineralogy*, p. 297, 298.) Wallerius aſſerts, that it has been ſo found in Poland, a ſpecimen of which was kept in the collection of Richter; and adds, that a ſimilar one found at Schneberg, was ſeen in the collection of Spener. (*Mineralogy*, vol. ii. p. 301.)

Dr Lawſon, in his Engliſh edition of Cramer's Art of Eſſaying Metals, ſays, that ſome pure native malleable lead had been lately found in New England; (p. 147.) And laſtly, Profeſſor Bergman did not heſitate to inſert, by itſelf alone, the *plumbum nativum*, in Sect. 180. of his *Sciagraphia*.

[2.] Calciform Lead.

Lead is found,

A. In the form of a calx.

A. Pure.

a. Friable lead ochre, native ceruſe.

b. Indurated lead ſpar, or ſpatoſe lead ore.

i. Radiated, or fibrous.

1. White, from Mendip-hills, in England.

ii. Cryſtalliſed in a priſmatic figure.

1. White, from Norrgrufva in Weſtmanland.

2. Yellowiſh green, from Zchopau in Saxony.

B. Mixed.

1. With the calx of arſenic, arſenical lead ſpar.

2. Indurated.

a. White. Mr Cronſtedt has tried ſuch an ore from an unknown place in Germany, and found that no metallic lead could be melted from it by means of the blow-pipe, as can be done out of other lead ſpars; but it muſt be performed in a crucible. (See the article Lead, par. iii.)

3. With a calcareous earth.

This ore effervesces with aqua-fortis, and contains 40 *per cent.* of lead: on which account it is placed here rather than among the calcareous earths.

B. Mineraliſed.

1. With ſulphur alone: the *bley-ſchweiff*, or *bleyglanz*, of the Germans.

a. Steel-grained lead ore.

b. Radiated, or antimoniated lead ore.

c. Teſſellated, or potter's lead-ore.

At Villach in Auſtria there is ſaid to be found a potter's lead-ore, which contains not the leaſt portion of ſilver.

2. Mineraliſed by the vitriolic acid.

This ore was diſcovered by Mr Monnet. It occurs ſometimes, though rarely, in the form of a white ponderous calx; and ſeems to originate from the ſpontaneous decompoſition of the ſulphurated lead-ores abovementioned.

3. By the acid of phoſphorus.

This ore was lately diſcovered by Ghan; and is of a greeniſh colour, by reaſon of a mixture of iron. See the article Lead, par. 6.

4. With ſulphurated ſilver. *Galena*; alſo called *bleyglanz* by the Germans. Potter's ore.

a. Steel grained.

b. With ſmall ſcales.

c. Fine-grained.

d. Of a fine cubical texture; and,

e. Of coarſe cubes. Theſe two varieties are found in all the Swediſh ſilver-mines.

f. Cryſtalliſed.

The ſteel-grained and ſcaly ores are of a dim and dull appearance when they are broken, and their particles have no determined angular figure: they are therefore in Swediſh commonly called *blyſchweif*; in oppoſition to the cubical ores, which are called *blyglanz*. The moſt part of the ores called *blyglanz* contain ſilver, even to 24 ounces *per cent.* of which we have inſtances in the mines of Salberg, where it has been obſerved, that the coarſe cubical lead ores are generally the richeſt in ſilver, contrary to what is commonly taught in books; the reaſon of which may perhaps be, that, in making the eſſays on thoſe two ores, the coarſe cubical can be choſen purer or freer from the rock than the fine cubical ores.

5. With ſulphurated iron and ſilver. This is found,

a. Fine-grained. *b*. Fine cubical. *c*. Coarſe-cubical. When this ore is ſcorified, it yields a black ſlag; whereas the preceding lead-ores yield a yellow one, becauſe they do not contain any iron.

6. With ſulphurated antimony and ſilver; antimoniated or radiated lead-ore. This has the colour of a blyglanz, but is of a radiated texture.

It is found,

a. Of fine rays and fibres; and,

b. Of coarſe rays or fibres. The lead in this ore prevents any uſe being made of the antimony to advantage; and the antimony likewiſe in a great meaſure hinders the extracting of the ſilver.

7. Mineraliſed by arſenic

This ore was lately diſcovered in Siberia.—Externally it is of a pale, and internally of a deep red colour. See the article Lead, par. 10.

C. Mixed with earth; ſtony, or ſandy lead ores.

Theſe conſiſt either of the calciform or of the galena kind, intimately mixed and diffuſed through ſtones and earth, chiefly of the calcareous or of the barytic genus. See Lead, par. 11.

Uſes, &c. *of Lead*. See Lead, and the other articles above referred to.

III. Copper; *Cuprum*, *Venus*, *Æs*. (See the article Copper: Alſo Chemistry-*Index*; and Metallurgy, Part II. ſect. iv. and Part III. ſect. iv.)

This metal is,

a. Of a red colour.

b. It is pretty ſoft and tough.

c. The calx of copper being diſſolved by acids becomes green, and by alkalies blue.

d. It is eaſily calcined in the fire into a blackiſh blue ſubſtance, which, when rubbed to a fine powder, is red; when melted together with glaſs, it tinges it firſt reddiſh brown, and afterwards of a tranſparent green or ſea-green colour.

e. It diſſolves in all the acids, and likewiſe in alkaline ſolutions. It is eaſier diſſolved when in form of a calx than in a metallic ſtate, eſpecially by the acids of vitriol and ſea-ſalt, and the vegetable acid.

f. Vitriol of copper is of a deep blue colour; but the vegetable acid produces with the copper a green ſalt, which is verdigris.

g. It can be precipitated out of the ſolutions in a metallic ſtate; and this is the origin of the precipitated copper of the mines called *Ziment copper*.

h. It is not eaſily amalgamated with quickſilver; but requires for this purpoſe a very ſtrong trituration, or the admixture of the acid of nitre.

i. It becomes yellow when mixed with zinc, which has a ſtrong attraction to it, and makes braſs, pinchbeck, &c.

k. When the metal is expoſed to the fire, it gives a green colour to the flame in the moment it begins to melt, and continues to do ſo afterwards, without loſing any thing conſiderable of its weight.

[1.] Native copper.

Copper found naturally in a metallic ſtate, is called *virgin* or *native copper*. It is met with,

1. Solid.

2. Friable, in form of ſmall, and ſomewhat coherent grains. Precipitated or ziment copper.

[2.] Calciform.

Copper, in form of a calx, is found,

1.) Pure.

A. Looſe or friable; *Ochra veneris*.

1. Blue; *Cœruleum montanum*. Very ſeldom found perfectly free from a calcareous ſubſtance.

2. Green; *Viride montanum*. Both this and the former colour depend on menſtrua, which often are edulcorated or waſhed away.

3. Red. This is an efflореſcence of the glaſs copper ore.

B. Indurated. Glaſs copper-ore.

a. Red. This is ſometimes as red as ſealing wax, and ſometimes of a more liver-brown colour.

It is always found along with native copper, and ſeems to have loſt its phlogiſton by way of efflореſcence, and to be changed into this form. It is likewiſe found with the ſulphurated copper, improperly called *glaſs copper ore*.

2.) Mixed.

A. Looſe or friable; *Ochra veneris friabilis impura*.

1. Mixed with a calcareous ſubſtance; *Cœruleum montanum*. In this ſtate copper-blue is moſtly found. It ferments during the ſolution in aquafortis.

2. Mixed with iron. Black. It is the decompoſition of the Fahlun copper ore.

B. Indurated.

1. Mixed with gypſum, or plaſter. Green.

2. Mixed with quartz. *a*. Red, from Sunnerſkog in the province of Smoland.

3. Mixed with lime. *a*. Blue. This is the *Lapis Armenus*, according to the accounts given of it by authors.

3.) Cupreous ſtones.

Analogous to the calciform copper ores, are,

1. The *lapis armenus*. } See the detached article Copper, n° 7.
2. The turquoiſe. }

[3.] Diſſolved and mineraliſed; *Cuprum mineraliſatum*.

A. With ſulphur alone. Grey copper-ore; alſo called, improperly, *glaſs copper-ore*.

a. Solid, without any certain texture, and very ſoft, ſo that it can be cut with a knife almoſt as eaſily as black lead.

b. Fine cubical. In Smoland this is ſometimes found decompoſed or weathered, and changed into a deep mountain blue.

B. With ſulphurated iron. *Minera cupri pyritacea;* yellow copper ore. Marcaſitical copper ore; *Pyrites cupri.* This is various both in regard to colour and in regard to the different proportion of each of the contained metals; for inſtance,

a. Blackiſh grey, inclining a little to yellow; *Pyrites cupri griſeus.* When decayed or weathered, it is of a black colour; is the richeſt of all the varieties of this kind of copper ore, yielding between 50 and 60 *per cent.* and is found in Spain and Germany.

b. Reddiſh yellow, or liver brown, with a blue coat on the ſurface; *Minera cupri lazurea,* This ore yields between 40 and 50 *per cent.* of copper, and is commonly ſaid to be blue, though it is as red, when freſh broken, as a red copper regulus.

c. Yellowiſh green; *Pyrites cupri flavo vireſcens.* This is the moſt common in the north part of Europe: and is, in regard to its texture, found,

1. Solid, and of a ſhining texture.
2. Steel grained, of a dim texture.
3. Coarſe-grained, of an uneven and ſhining texture.
4. Cryſtalliſed marcaſitical copper ore.
   a. Of long octoedrical cryſtals.

d. Pale yellow. This cannot be deſcribed but as a marcaſite, though an experienced eye will eaſily diſcover ſome difference between them. It yields 22 *per cent.* of copper.

e. Liver-coloured.

C. With ſulphurated ſilver, arſenic, and ſome iron, Fallow copper-ore; which contains only a few ounces of ſilver. This ore is found in Hungary and Germany, where it is called *black copper ore.*

D. With ſulphurated arſenic and iron. White copper ore.

E. Pyritous copper, with arſenic and zinc.

According to Mr Monnet, this ore is found at Catharineberg in Bohemia. It is of a brown colour; of a hard, ſolid, compact, granular texture; and contains from 18 to 30 *per cent.* of copper.

F. Diſſolved by the vitriolic acid; *Vitriolum veneris.* See the article copper, n° xiii.

G. With phlogiſton. Copper coal ore, conſiſting of the calces of copper, mixed with a bituminous earth.

H. Mineraliſed by the muriatic acid. This ore was found in Saxony, and had been generally miſtaken for a micaceous ſubſtance, which in fact it greatly reſembles. It has not yet been found in large maſſes, but only in a ſuperficial form, like a cruſt over other ores. It is moderately hard and friable; of a fine green colour, and ſometimes of a bluiſh green, cryſtalliſed in a cubic form, or with a foliated texture, or in little ſcales reſembling green mica or talc. This ore is eaſily diſſolved by nitrous acid: the ſolution takes a green colour; and the metal may be precipitated on a poliſhed plate of iron. If ſome drops of a nitrous ſolution of ſilver be mixed with it, a white powder of *luna cornea* will be precipitated, which diſcovers the preſence of the muriatic acid in this ore.

The uſes of copper are very numerous, although not thoroughly known to every one. Several of theſe have been mentioned under the detached article, and in Chemistry. Others of great importance may be here added. Its great ductility, lightneſs, ſtrength, and durability, render it of very extenſive utility. Blocks, or bars of copper, are reduced into flat ſheets of any thickneſs, by being firſt heated by the reverberation of the flame, in a low vaulted furnace, properly conſtructed for the purpoſe; and then immediately applied between large rollers of ſteel, or rather of caſe-hardened iron, turned by a water-wheel or by the ſtrength of horſes, ſo that the hot metal is there quickly ſqueezed; and the operation is repeated, bringing the rollers every time nearer to one another, till the metallic ſheet acquires the intended thickneſs.

Theſe copper ſheets are very advantageouſly employed in ſheathing the bottoms of men of war and other veſſels, which by this means are prevented from being attacked by the ſea worms, and are kept clean from various marine concretions, ſo as to ſail with conſiderably greater ſwiftneſs. Copper ſheets are alſo employed to cover the tops of buildings inſtead of ſlates or earthen tiles, as is uſed in Sweden; and ſome architects have begun to introduce the uſe of copper covering into Great Britain, which is much lighter, and may be uſed with great advantage, although it muſt be much dearer in prime coſt.

Sundry preparations of copper are employed in painting, ſtaining, and for colouring glaſs and enamels. See Glass and Enamel.

The ſolution of copper in aqua-fortis ſtains marble and other ſtones of a green colour; when precipitated with chalk or whiting, it yields the green and the blue verditer of the painters. According to Lewis, a ſolution of the ſame metal in volatile ſpirits ſtains ivory and bones: when macerated for ſome time in the liquor, they become of a fine blue colour, which, however, tarniſhes by expoſure to the air, and becomes green afterwards.

The ſame author prepared elegant blue glaſſes, by melting common glaſs, or powdered flint and fixed alkaline ſalt, with blue vitriol, and with an amalgam of copper; fine green ones were made with green verditer, and with blue verditer, as well as with the precipitate of copper made by fixed alkalies, and with a precipitate by zinc; and a reddiſh glaſs was produced by the calx and ſcoria of copper made by fire alone. Even in this vitreous ſtate, it ſeems as if a continuance of fire had the ſame effect in regard to colour, as air has upon copper in other forms; as ſome of the moſt beautiful blue glaſſes, by continued fuſion, have changed to a green colour. See farther the article Brass *in the Glaſs-trade.*

Verdegris is a preparation of copper diſſolved by the vegetable acids, which act on this metal, diſſolving it very ſlowly, but in conſiderable quantities. It produces a fine green pigment for painting both in oil and water colours, inclining more or leſs to the bluiſh according to circumſtances.

So great is the tenacity of copper, that a wire of a tenth of an inch in diameter is capable of ſupporting 299.5 pounds weight before it breaks.—Copper may be drawn into very fine wire, and beaten into extremely thin plates. The German artiſts, chiefly thoſe of Nurenberg and Auſburg, are ſaid to poſſeſs the beſt method for giving to theſe thin plates of copper a fine yellow colour like that of gold. See the articles *Brass-Colour* and *Brass-Leaf.*

The parings or ſhreds of theſe very thin leaves of yellow copper being well ground on a marble plate, are reduced to a powder ſimilar to gold, which ſerves to cover, by means of ſome gum-water, or other adheſive fluid, the ſurface of various moulding or other pieces of curious workmanſhip, giving them the appearance of real bronze, and even of fine gold; at a very trifling expence; becauſe the gold colour of this metallic powder may be eaſily raiſed and improved by ſtirring it on a wide earthen baſon over a ſlow fire.

In ſome of its ſtates, copper is as difficulty extended under the hammer as iron, but proves ſofter to the file, and never can be made hard enough to ſtrike a ſpark with flint or other ſtones; from whence proceeds the uſe that is made of this metal for chiſels, hammers, hoops, &c. in the gun-powder works.

The vitriolic acid does not act on copper unleſs concentrated and boiling: during this ſolution a great quantity of ſulphureous gas flies off; afterwards a brown thickiſh matter is found, which contains the calx of the metal partly combined with the acid. By ſolution and filtration, a blue ſolution is obtained, which being evaporated to a certain degree, produces after cooling long rhomboidal cryſtals of a beautiful blue colour, called vitriol of copper; but if this ſolution be merely expoſed a long time to the air, it affords cryſtals, and a green calx is precipitated, a colour which all calces of this metal aſſume when dried by the air. Blue vitriol, however, is ſeldom formed by diſſolving the metal directly in the vitriolic acid. That ſold in the ſhops is moſtly obtained from copper pyrites. It may alſo be made by ſtratifying copper-plates with ſulphur, and cementing them together for ſome time; becauſe the vitriolic acid of the ſulphur being diſengaged, attacks and corrodes the metal, forming a metallic ſalt, which by affuſion of water yields perfect cryſtals of blue vitriol. See Vitriol.

The nitrous acid, on the contrary, diſſolves copper when cold with great rapidity; and a great quantity of ſmoaking air or gas flies off, which, on being received in a pneumatic apparatus, and mixed in a glaſs tube with atmoſpheric air, ſhows its good or bad quality for the reſpiration of living animals, according as the common bulk is more or leſs diminiſhed. This is one of the moſt important of Dr Prieſtley's diſcoveries; and various inſtruments known by the name of *eudiometers* have been ſince invented for making theſe experiments with eaſe and ſatisfaction. See Eudiometer.

But the moſt common uſe of copper is to make all ſorts of large ſtills, boilers, pots, funnels, and other veſſels employed by diſtillers, dyers, chemiſts, and various other manufacturers, who make uſe of large quantities of hot liquors in their various operations.

Although copper when pure is extremely valuable, on account of its ductility, lightneſs, and ſtrength, it is, however, leſs uſeful on many occaſions from the difficulty of forming large maſſes of work, as it is not an eaſy matter to caſt copper ſolid, ſo as to retain all its properties entire. For if the heat be not ſufficiently great, the metal proves deficient in toughneſs when cold; and if the heat be raiſed too high, or continued for a length of time, the copper bliſters on the ſurface when caſt in the moulds: ſo that the limits of its fuſion are very contracted. And from theſe circumſtances pure copper is rendered leſs applicable to ſeveral purpoſes.

We find, however, that the addition of a certain proportion of zinc removes almoſt all theſe inconveniences, and furniſhes a mixed metal more fuſible than copper, very ductile and tenacious when cold, which does not ſo readily ſcorify in a moderate heat, and which is leſs apt to ruſt from the action of air and moiſture.

Copper is the baſis of ſundry compound metals for a great number of mechanical and œconomical uſes of life, ſuch as braſs (y), prince's-metal, tombac, bell-metal, white copper, &c. See Chemistry, n° 1154, &c.

If the mixture is made of four to ſix parts of copper, with one part of zinc, it is called *Prince's-metal.* If more of the copper is taken, the mixture will be of a deeper yellow, and then goes by the name of *tombac.*

(y) Braſs is frequently made by cementing plates of copper with calamine, where the copper imbibes one-fourth or one-fifth its weight of the zinc which riſes from the calamine. The proceſs conſiſts in mixing three parts of the calamine and two of copper with charcoal duſt in a crucible, which is expoſed to a red heat for ſome hours, and then brought to fuſion. The vapours of the calamine penetrate the heated plates of copper, and add thereby to its fuſibility. It is of great conſequence for the ſucceſs of this proceſs to have the copper cut into ſmall pieces, and intimately blended with the calamine. See Chemistry, n° 1154.

In moſt foreign founderies the copper is broken ſmall by mechanical means with a great deal of labour; but

Imperfect Metals. Iron.

Bell-metal is a mixture of copper and tin, forming a compound extremely hard and sonorous, and is less subject to alterations by exposure to the air than any other cheap metal. On this account it is advantageously employed in the fabrication of various utensils and articles, as cannons, bells, statues, &c. in the composition of which, however, other metals are mixed in various proportions, according to the fancy and experience of the artiſt.

White-copper is prepared with arſenic and nitre, as mentioned under Chemistry, n° 1157.

But the principal kind of white-copper is that with which ſpeculums of reflecting teleſcopes are made. See the article Speculum.

VII. Iron; *Ferrum, Mars.* This metal is,

- *a.* Of a blackiſh blue ſhining colour.
- *b.* It becomes ductile by repeated heating between coals and hammering.
- *c.* It is attracted by the loadſtone, which is an iron ore; and the metal itſelf may alſo be rendered magnetical.
- *d.* Its ſpecific gravity to water is as 7,645, or 8000 : 1000.
- *e.* It calcines eaſily to a black ſcaly calx, which, when pounded, is of a deep red colour.
- *f.* When this calx is melted in great quantity with glaſs compoſitions, it gives a blackiſh brown colour to the glaſs; but in a ſmall quantity a greeniſh colour, which at laſt vaniſhes if forced by a ſtrong degree of heat.
- *g* It is diſſolved by all ſalts, by water, and likewiſe by their vapour. The calx of iron is diſſolved by the ſpirit of ſea ſalt and by aqua-regia.
- *h.* The calx of the diſſolved metal becomes yellow, or yellowiſh brown: and in a certain degree of heat it turns red.
- *i.* The ſame calx, when precipitated from acids by means of the fixed alkali, is of a greeniſh colour; but it becomes blue when precipitated by means of an alkali united with phlogiſton; in which laſt circumſtance the phlogiſton unites with the iron: theſe two precipitates loſe their colour in the fire, and turn brown.
- *k.* The vitriol of iron is brown.

Iron is found,

[1.] Native. See the detached article Iron.

[2.] In form of calx.

A. Pure.

A. Looſe and friable. Martial ochre; *Minera ochracea.*

1. Powdery; *Ochra ferri.* This is commonly yellow or red, and is iron which has been diſſolved by the vitriolic acid.
2. Concreted. Bog-ore.
   - *a.* In form of round porous balls.
   - *b.* More ſolid bars.
   - *c.* In ſmall flat pieces, like cakes or pieces of money.
   - *d.* In ſmall grains.

e. In

Imperfect Metals. Iron.

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at Briſtol the workmen employ an eaſier method. A pit is dug in the ground of the manufacture about four feet deep, the ſides of which are lined with wood. The bottom is made of copper or braſs, and is moveable by means of a chain. The top is made alſo of braſs with a ſpace near the centre, perforated with ſmall holes, which are luted with clay; through them the melted copper is poured, which runs in a number of ſtreams into the water, and this is perpetually renewed by a freſh ſtream that paſſes through the pit. As the copper falls down it forms itſelf into grains, which collect at the bottom. But great precaution is required to hinder the dangerous exploſions which melted copper produces when thrown into cold water; which end is obtained by pouring ſmall quantities of the metal at once. The granulated copper is completely mixed with powdered calamine, and fuſed afterwards. The proceſs laſts eight or ten hours, and even ſome days, according to the quality of the calamine.

It is a wonderful thing, ſays Cramer, that zinc itſelf, being ſimply melted with copper, robs it of all its malleability; but if it be applied in form of vapour from the calamine, the ſublimates, or the flowers, it does not cauſe the metal to become brittle.

The method mentioned by Cramer to make braſs from copper, by the volatile emanations of zinc, ſeems to be preferable to any other proceſs, as the metal is then preſerved from the heterogeneous parts contained in the zinc itſelf, or in its ore. It conſiſts in mixing the calamine and charcoal with moiſtened clay, and ramming the mixture to the bottom of the melting pot, on which the copper, mixed alſo with charcoal, is to be placed above the rammed matter. When the proper degree of heat is applied, the metallic vapour of the zinc contained in the calamine will tranſpire through the clay, and attach itſelf to the copper, leaving the iron and the lead which were in the calamine retained in the clay, without mixing with the upper metal. Dr Watſon ſays that a very good metallurgiſt of Briſtol, named John Champion, has obtained a patent for making braſs by combining zinc in the vapours form with heated copper plates; and that the braſs from this manufacture is reported to be of the fineſt kind: but he knows not whether the method there employed is the ſame with that mentioned by Cramer.

Braſs is ſometimes made in another way, by mixing the two metals directly; but the heat requiſite to melt the copper makes the zinc burn and flame out, by which the copper is defrauded of the due proportion of zinc. If the copper be melted ſeparately, and the melted zinc poured into it, a conſiderable and dangerous exploſion enſues; but if the zinc is only heated and plunged into the copper, it is quickly imbibed and retained. The union, however, of theſe two metals ſucceeds better if the flux compoſed of inflammable ſubſtanees be firſt fuſed in the crucible, and the copper and zinc be poured into it. As ſoon as they appear thoroughly melted, they are to be well ſtirred, and expeditiouſly poured out, or elſe the zinc will be inflamed, and leave the red copper behind.

c. In lumps of an indeterminate figure.

All theſe are of a blackiſh brown, or a light brown colour.

B. Indurated. The blood-ſtone; *Hæmatites.*

(1.) Of an iron colour; *Hæmatites cœruleſcens.* This is of a bluiſh grey colour; it is not attracted by the loadſtone, yields a red powder when rubbed, and is hard.

a. Solid, and of a dim appearance when broken.

b. Cubical, and of a ſhining appearance when broken.

c. Fibrous, is the moſt common *torrſten* of Sweden.

d. Scaly: the *eiſenram* of the Germans.

1. Black.

2. Bluiſh grey. When this is found along with marcaſite, it is not only attracted by the loadſtone, but is of itſelf really a loadſtone.

e. Cryſtalliſed.

1. In octoedrical cryſtals.

2. In polyedrical cryſtals.

3. In a cellular form.

Theſe varieties are the moſt common in Sweden, and are very ſeldom blended with marcaſite or any other heterogeneous ſubſtance except their different beds. It is remarkable, that when theſe ores are found along with marcaſite, thoſe particles which have lain neareſt to the marcaſite are attracted by the loadſtone, although they yield a red or reddiſh brown powder, like thoſe which are not attracted by the load-ſtone: it is likewiſe worth obſervation, that they generally contain a little ſulphur, if they are imbedded in a limeſtone rock.

(2.) Blackiſh brown bloodſtone; *Hæmatites nigreſcens.* Kidney ore. This yields a red or brown powder when it is rubbed; it is very hard, and is attracted by the loadſtone.

a. Solid, with a glaſſy texture.

b. Radiated.

c. Cryſtalliſed.

1. In form of cones, from Siberia.

2. In form of concentric balls, with a facetted ſurface. Theſe are very common in Germany, but very ſcarce in Sweden.

(3.) Red bloodſtone; *Hæmatites Ruber.* Red kidney ore.

a. Solid, and dim in its texture.

b. Scaly. The *eiſenram* of the Germans. This is commonly found along with the iron-coloured iron glimmer, and ſmears the hands.

c. Cryſtalliſed, in concentric balls, with a flat or facetted ſurface.

(4.) yellow blood-ſtone; *Hæmatites flavus.*

a. Solid.

b. Fibrous.

The varieties of the colours in the blood-ſtone are the ſame with thoſe produced in the calces of iron made by dry or liquid menſtrua and afterwards expoſed to different degrees of heat.

B. Mixed with heterogeneous ſubſtances.

A. With a calcareous earth. White ſpathoſe iron ore. The *ſtahlſtein* of the Germans.

B. With a ſiliceous earth. The martial jaſper of Sinople.

C. With a garnet earth. Garnet and cockle or ſhirl.

D. With an argillaceous earth. The bole.

E. With a micaceous earth. Mica.

F. With mangancſe.

G. With an alkali and phlogiſton. Blue martial earth. Native Pruſſian-like blue.

1. Looſe or powdery.

H. With an unknown earth, which hardens in water. Tarras; *Cementum.*

1. Looſe or granulated; *Terra Pazzolana.* This is of a reddiſh brown colour, is rich in iron, and is pretty fuſible.

2. Indurated; *Cementum induratum.* This is of a whitiſh yellow colour, contains likewiſe a great deal of iron, and has the ſame quality with the former to harden ſoon in water when mixed with mortar. This quality cannot be owing to the iron alone, but rather to ſome particular modification of it occaſioned by ſome accidental cauſes, becauſe theſe varieties rarely happen at any other places except where volcanoes have been, or are yet, in the neighbourhood.

[3.] Diſſolved or mineraliſed.

A. With ſulphur alone.

A. Perfectly ſaturated; *Ferrum ſulphure ſaturatum.* Marcaſite.

B. With very little ſulphur. Black iron ore. Iron ſtone.

This is either attracted by the loadſtone, or is a loadſtone itſelf attracting iron; it reſembles iron, and yields a black powder when rubbed.

1.) Magnetic iron ore. The loadſtone, *Magnes.*

a. Steel-grained, of a dim texture, from Hogberget in the pariſh of Gagnœf in Dalarne: it is found at that place almoſt to the day, and is of as great ſtrength as any natural loadſtones were ever commonly found.

b. Fine grained, from Saxony.

c. Coarſe-grained, from Spetalſgrufvan at Norberg, and Kierrgrufvan, both in the province of Weſtmanland. This loſes very ſoon its magnetical virtue.

d. With coarſe ſcales, found at Sandſwœr in Norway. This yields a red powder when rubbed.

2.) Refractory iron ore. This in its crude ſtate is attracted by the loadſtone.

a. Giving a black powder when rubbed; *Tritura atra.* Of this kind are,

1. Steel-grained.

2. Fine grained.

3. Coarſe grained.

This kind is found in great quantities in all the Swediſh iron mines, and of this moſt part of the fuſible ores conſiſt, becauſe it is commonly found in ſuch kinds of rocks as are very fuſible: and it is as ſeldom met with in quartz as the hæmatites is met with in limeſtone.

b. Rubbing into a red powder. Theſe are real hæmatites, that are ſo far modified by ſulphur or lime as to be attracted by the loadſtone.

1. Steel-grained.
2. Fine-grained. Emery. This is imported from the Levant: it is mixed with mica, is ſtrongly attracted by the loadſtone, and ſmells of ſulphur when put to the fire.
3. Of large ſhining cubes.
4. Coarſe, Scaly. The *eiſenglimmer* or *eiſenran*.

[4.] Mixed with various foſſile ſubſtances.

1. With ſulphur and clay; Pyrites.
2. With arſenic; called *miſpickel* by the Germans, and *plate mundic* in Cornwall.
3. With ſulphurated arſenic. Arſenical pyrites.
4. With vitriolic acid. Martial vitriol.
5. With phlogiſton. Martial coal ore.
6. With other ſulphurated and arſenicated metals. See theſe in their reſpective arrangements.

Uſes and Properties of Iron. Iron is the moſt common metal in nature, and at the ſame time the moſt uſeful in common life; notwithſtanding which, its qualities are perhaps very little known.

Iron has a particular and very ſenſible ſmell when ſtrongly rubbed or heated; and a ſtyptic taſte, which it communicates to the water in which it is extinguiſhed after ignition. Its tenacity, ductility, and malleability, are very great. It exceeds every other metal in elaſticity and hardneſs, when properly tempered. An iron wire of one-tenth of an inch thick is able to ſupport 450 pounds weight without breaking, as Wallerius aſſerts.

Iron drawn into wire as ſlender as the fineſt hairs. It is more eaſily malleable when ignited than when cold; whereas other metals, though ductile when cold, become quite brittle by heat.

It grows red-hot ſooner than other metals: nevertheleſs it melts the moſt difficultly of all, platina and manganeſe excepted. It does not tinge the flame of burning matters into bluiſh or greeniſh colours, like other imperfect metals, but brightens and whitens it; hence the filings of iron are uſed in compoſitions of fire-works, to produce what is called *white-fire*.

Iron, or rather ſteel, expands the leaſt of all hard metals by the action of heat; but braſs expands the moſt: and on this account theſe two metals are employed in the conſtruction of compound pendulums for the beſt ſort of regulating clocks for aſtronomical purpoſes

Iron, in the act of fuſion, inſtead of continuing to expand, like the other metals, ſhrinks, as Dr Lewis obſerves; and thus becomes ſo much more denſe as to throw up ſuch part as is unmelted to the ſurface; whilſt pieces of gold, ſilver, copper, lead, and tin, put in the reſpective metals in fuſion, ſink quickly to the bottom. But in its return to a conſiſtent ſtate, inſtead of ſhrinking, like other metals, it expands; ſenſibly riſing in the veſſel, and aſſuming a convex ſurface, whilſt the others ſubſide, and appear concave. This property of iron was firſt taken notice of by Reamur, and excellently fits it for receiving impreſſions from the moulds into which it is caſt, being forced into their minuteſt cavities. Even when poured thick into the mould, it takes, nevertheleſs, a perfect impreſſion; and it is obſerved, that caſt iron is ſomewhat larger than the dimenſions of the mould, whilſt caſt figures of other metals are generally ſmaller.

The vitriolic acid diſſolves iron readily, and forms green vitriol.

This acid requires to be diluted with 304 times its quantity of water, to enable it effectually to diſſolve iron; and, during the diſſolution; a ſtrong aerial fluid ariſes, called *inflammable air*, which, on being mixed with atmoſpheric air, takes fire at the approach of the flame of a candle. A glaſs phial, of about two ounces meaſure, with one third of inflammable air, and the reſt of common air, produces a very loud report if opened in the ſame circumſtance; and if it be filled with two-thirds of inflammable air, mixed with one of dephlogiſticated air, the report will be as loud as the exploſion of a piſtol with gunpowder.

Dilute nitrous acid diſſolves iron; but this ſaline combination is incapable of cryſtalliſing. Strong nitrous acid corrodes and dephlogiſticates a conſiderable quantity of iron, which falls to the bottom.

Marine acid likewiſe diſſolves iron, and this ſolution is alſo incryſtalliſable.

The Pruſſian acid precipitates iron from its ſolutions in the form of Pruſſian blue.

This metal is likewiſe ſenſibly acted upon by alkaline and neutral liquors, and corroded even by thoſe which have no perceptible ſaline impregnation; the oils themſelves, with which iron utenſils are uſually rubbed to prevent their ruſting, often promote this effect in ſome meaſure, unleſs the oils have been previouſly boiled with litharge or calces of lead.

Galls, and other aſtringent vegetables, precipitate iron from its ſolutions, of a deep blue or purple colour, of ſo intenſe a ſhade as to appear black. It is owing to this property of iron that the common writing ink is made. The infuſion of galls, and alſo the Pruſſian alkali, are teſts of the preſence of iron by the colours they produce on any fluid. Acids, however, diſſolve the coloured precipitates by the former; and hence it ariſes that the marine acid is ſucceſsfully applied to take off ink ſpots and iron ſtains from white linens. Alkalis, however, convert theſe iron precipitates into a brown ochre.

Iron has a ſtrong affinity with ſulphur. If a bar of iron be ſtrongly ignited, and a roll of brimſtone be applied to the heated end, it will combine with the iron, and form a fuſible maſs, which will drop down. A veſſel of water ought to be placed beneath for the purpoſe of receiving and extinguiſhing it, as the fumes would otherwiſe be very inconvenient to the operator.

A mixture of iron-filings and ſulphur in powder, moiſtened with water, and preſſed ſo as to form a paſte, will in a few hours ſwell, become hot, fume, and even burſt into a flame, if the quantity is large. The reſiduum furniſhes martial vitriol. This proceſs is ſimilar to the decompoſition of martial pyrites; from which ſome philoſophers account for hot ſpring-waters and ſubterraneous fires. The mixture of water in this paſte ſeems to be neceſſary to enable the vitriolic acid of the ſulphur to act on the iron.

For other chemical properties of this metal, ſee CHEMISTRY-*Index;* for its electrical and magnetic properties, ſee ELECTRICITY and MAGNETISM. For a more particular account of its nature and uſes, and the methods of making and manufacturing it, ſee the articles IRON and STEEL; alſo METALLURGY, Part II. ſect. vii. and Part III. ſect. v.

Order III. SEMIMETALS.

I. Biſmuth; tin-glaſs. *Viſmutum, Biſmutum, Marcaſita officinalis.* It is,

a. Of a whitiſh yellow colour.

b. Of a laminated texture, ſoft under the hammer, and neverthelefs very brittle.

c. It is very fuſible; calcines and ſcorifies like lead, if not rather eaſier: and therefore it works on the cuppel. It is pretty volatile in the fire.

d. Its glaſs or ſlag becomes yellowiſh brown, and has the quality of retaining ſome part of the gold, if that metal has been melted, calcined, and vitrified with it.

e. It may be mixed with the other metals, except cobalt and zinc, making them white and brittle.

f. It diſſolves in aqua-fortis, without imparting to it any colour; but to the aqua-regia it gives a red colour, and may be precipitated out of both theſe ſolutions with pure water into a white powder, which is called *Spaniſh white.* It is alſo precipitated by the acid of ſea-ſalt; which laſt unites with it, and makes the *viſmutum corneum.*

g. It amalgamates eaſily with quickſilver. Other metals are ſo far attenuated by the biſmuth, when mixed with it, as to be ſtrained or forced along with the quickſilver through ſkins or leather.

Biſmuth is found in the earth.

A. Native. This reſembles a regulus of biſmuth, but conſiſts of ſmaller ſcales or plates.

1. Superficial, or in cruſts.

2. Solid, and compoſed of ſmall cubes.

B. In form of calx.

1. Powdery or friable; *Ochra viſmuti.* This is of a whitiſh yellow colour; it is found in form of an eﬄoreſcence.

It has been cuſtomary to give the name of *flowers of biſmuth* to the pale red calx of cobalt, but it is wrong; becauſe neither the calx of biſmuth, nor its ſolutions, become red, this being a quality belonging to the cobalt.

C. Mineraliſed biſmuth. This is, with reſpect to colour and appearance, like the coarſe teſſelated potter's lead ore; but it conſiſts of very thin ſquare plates or flakes, from which it receives a radiated appearance when broken croſswiſe.

1. With ſulphur.

a. With large plates or flakes.

b. With fine or ſmall ſcales.

2. With ſulphurated iron.

a. Of coarſe wedge-like ſcales.

This mineraliſed biſmuth ore yields a fine radiated regulus; for which reaſon it has been ranked among the antimonial ores by thoſe who have not taken proper care to melt a pure regulus ore deſtitute of ſulphur from it; while others, who make no difference between regulus and pure metals, have ſtill more poſitively aſſerted it to be only an antimonial ore.

3. With ſulphur and arſenic.

a. Of a whitiſh yellow or aſh colour. It has a ſhining appearance; and is compoſed of ſmall ſcales or plates, intermixed very ſmall yellow flakes: It is of a hard and ſolid texture: Sometimes ſtrikes fire with hard ſteel: Has a diſagreeable ſmell when rubbed: Does not efferveſce with aqua-fortis; but is partially diſſolved by the ſame acid (z).

b. Grey, of a ſtriated form; found at Helſingland in Sweden, and at Annaberg in Saxony.

c. With variegated colours of red, blue, and yellow grey; found at Schneeberg in Saxony.

d. With green fibres like an amianthus; at Miſnia in Germany, and at Gillebeck in Norway.

e. With yellow red ſhining particles, called *mines de biſmuth Tigrées* in French, at Georgenſtadt in Germany, and at Annaberg in Saxony.

f. The *minera biſmuthi arenacea*, mentioned by Wallerius and Bomare, belongs alſo to the ſame kind of the arſenicated ores.

4. By vitriolic acid. This ore is called *wiſmuth bluth* by the Germans. It is ſaid to be of a yellowiſh, reddiſh, or variegated colour; and to be found mixed with the calx of biſmuth, incruſting other ores. *Kirwan*, p. 334.

Uſes, &c. of Biſmuth. See the article BISMUTH. Alſo CHEMISTRY-*Index;* and METALLURGY, Part II. ſect. x. and Part III. ſect. viii.

II.

(z) This ſolution, being diluted with water, becomes a kind of ſympathetic ink; as the words written with it on white paper, and dried, are not diſtinguiſhed by the eye; but on being heated before the fire, they aſſume a yellowiſh colour.

Semi-metals. Zinc.

II. Zinc; ſpeltre. *Zincum.*

a. Its colour comes neareſt to that of lead, but it does not ſo eaſily tarniſh.

b. It ſhows a texture when it is broken, as if it were compounded of flat pyramids (A).

c. Its ſpecific gravity to water is as 6,900 or 7000 to 1000.

d. It melts in the fire before it has acquired a glowing heat; but when it has gained that degree of heat, it burns with a flame of a changeable colour, between blue and yellow. If in an open fire, the calx riſes in form of ſoft white flowers; but if in a covered veſſel, with the addition of ſome inflammable, it is diſtilled in a metallic form: in which operation, however, part of it is ſometimes found vitrified.

e. It unites with all the metals (B) except biſmuth and nickel, and makes them volatile. It is, however, not eaſy to unite it with iron without the addition of ſulphur. It has the ſtrongeſt attraction to gold and copper, and this laſt metal acquires a yellow colour by it; which has occaſioned many experiments to be made to produce new metallic compoſitions.

f. It is diſſolved by all the acids: of theſe the vitriolic acid has the ſtrongeſt attraction to it; yet it does not diſſolve it, if it is not previouſly diluted with much water.

g. Quickſilver amalgamates eaſier with zinc than with copper; by which means it is ſeparated from compoſitions made with copper.

h. It ſeems to become electrical by friction.

Zinc is found,

A. Native.

Zinc has been met with native, though rarely, in the form of thin and flexible filaments, of a grey colour, which were eaſily inflamed when applied to a fire. And Bomare affirms that he has ſeen many ſmall pieces of native zinc among the calamine-mines in the duchy of Limbourg and in the zinc-mines at Goſlar, where this ſemimetal was always ſurrounded by a kind of ferruginous yellow earth, or ochraceous ſubſtances. See the detached article ZINC.

B. In form of calx.

Semi-metals. Zinc.

(1.) Pure.

a. Indurated.

1. Solid.

2. Cryſtalliſed.

This is of a whitiſh-grey colour, and its external appearance is like that of a lead ſpar; it cannot be deſcribed, but is eaſily known by an experienced eye. —It looks very like an artificial glaſs of zinc; and is found among other calamines at Namur and in England.

(2.) Mixed.

A. With a martial ochre.

1. Half indurated. Calamine; *Lapis calaminaris.*

a. Whitiſh yellow.

b. Reddiſh brown. This ſeems to be a mouldered or weathered blende.

B. With a martial clay or bole.

C. With a lead ochre and iron.

D. With quartz: Zeolite of Friburgh.

The real contents of this ſubſtance were firſt diſcovered by M. Pelletier. It was long taken for a true zeolite, being of a pearl colour, cryſtalliſed, and ſemitranſparent. It conſiſts of laminæ, diverging from different centres, and becoming gelatinous with acids. Its contents are 48 to 52 per cent. of quartz, 36 of calx of zinc, and 8 or 12 of water. (*Kirwan*, p. 318.)

C. Mineraliſed.

(1.) With ſulphurated iron. Blende, mock-lead, black-jack, mock-ore; *pſeudogalena* and *blende* of the Germans.

A. Mineraliſed zinc in a metallic form. Zinc ore. This is of a metallic bluiſh-grey colour, neither perfectly clear as a potter's ore, nor ſo dark as the Swediſh iron ores.

1. Of a fine cubical or ſcaly texture.

2. Steel-grained.

B. In form of calx. Blende. Mock-lead; *Sterile nigrum. Pſeudo-galena* (C.) This is found,

1. With courſe ſcales.

a. Yellow; ſemi tranſparent.

b. Greeniſh.

c. Greeniſh-

(A) It cannot be reduced into power under the hammer like other ſemimetals. When it is wanted very much divided, it muſt be granulated, by pouring it while fuſed into cold water; or filed, which is very tedious, as it ſtuffs and fills the teeth of the file. But if heated the moſt poſſible without fuſing it, Macquer aſſerts, that it becomes ſo brittle as to be pulveriſed in a mortar.

(B) It brightens the colour of iron almoſt into a ſilver hue; changes that of copper to a yellow or gold colour, but greatly debaſes the colour of gold and deſtroys its malleability. It improves the colour and luſtre of lead and tin, rendering them firmer, and conſequently fitter for ſundry mechanic uſes. Lead will bear an equal weight of zinc, without loſing too much of its malleability.—The proceſs for giving the yellow colour to copper, by the mixture of zinc, and of its ore called *calamine*, has been deſcribed above under the *Uſes of Copper.*

(C) The varieties of pſeudo-galena, or black-jack, are in general of a lamellar or ſcaly texture, and frequently of a quadrangular form, reſembling galena. They all loſe much of their weight when heated, and burn with a blue flame; but their ſpecific gravity is conſiderably inferior to that of true galena. Almoſt all contain a mixture of lead-ore. Moſt of them exhale a ſulphureous ſmell when ſcraped, or at leaſt when vitriolic or marine acid is dropped on them.

Semi-Metals. Zinc.

c. Greeniſh-black; *pechblende*, or *pitch blende* of the Germans.
d. Blackiſh-brown.

2. With fine ſcales,
a. White.
b. Whitiſh-yellow.
c. Reddiſh-brown.

3. Fine and ſparkling; at Goſlar called *braun blyertz*. Its texture is generally ſcaly; ſometimes cryſtalliſed and ſemitranſparent. It gives fire with ſteel; but does not decrepitate, nor ſmoke when heated: yet it loſes about 13 *per cent.* of its weight by torrefaction.

a. Dark-brown.

b. Red, which becomes phoſphoreſcent when rubbed; found at Scharfenberg in Miſnia. (*Brunich*).

c. Greeniſh, yellowiſh-green, or red. It has different degrees of tranſparency, and is ſometimes quite opaque. When ſcraped with a knife in the dark, it emits light, even in water; and after undergoing a white heat, if it is diſtilled *per ſe*, a ſiliceous ſublimate riſes, which ſhows it contains the ſparry acid, probably united to the metal, ſince it ſublimes.

4. Of a metallic appearance; *glanz blende*.

This is of a bluiſh-grey, of a ſcaly or ſteel-grained texture, and its form generally cubical or rhomboidal. It loſes nearly one ſixth of its weight by calcination; and after calcination it is more ſoluble in the mineral acids.

100 parts of this ore afforded to Bergman about 52 of zinc, 8 of iron, 4 of copper, 26 of ſulphur, 6 of ſilex, and 4 of water.

5. Cryſtalline.

a. Dark-red, very ſcarce; found in a mine near Freyberg. Something like it is found at the Morgenſtern and Himmelsfuſte.

b. Brown. In Hungary and Tranſylvania.

c. Black. Hungary.

Theſe varieties may eaſily be miſtaken for rock cryſtals; but by experience they may be diſtinguiſhed on account of their lamellated texture and greater ſoftneſs. Their tranſparency ariſes from a very ſmall portion of iron in them.

(2.) Zinc mineraliſed by the vitriolic acid.

This ore has been already deſcribed among the middle *Salts*, at *Vitriol of zinc*.

Uſes, &c. *of zinc*. See the detached article Zinc: Alſo Chemistry-*Index*; and Metallurgy, Part II. ſect xii. and Part III. under ſect. iii.

III. Antimony; *Antimonium Stibium*. This ſemimetal is,

a. Of a white colour almoſt like ſilver.

b. Brittle; and in regard to its texture, it conſiſts of ſhining planes of greater length than breadth.

Semi-Metals. Antimony.

c. In the fire it is volatile, and volatiliſes part of the other metals along with it, except gold and platina. It may, however, in a moderate fire, be calcined into a light-grey calx, which is pretty refractory in the fire; but melts at laſt to a glaſs of a reddiſh-brown colour.

d. It diſſolves in ſpirit of ſea-ſalt and aqua-regia, but is only corroded by the ſpirit of nitre into a white calx; it is precipitated out of the aqua-regia by water.

e. It has an emetic quality when its calx, glaſs, or metal, is diſſolved in an acid, except when in the ſpirit of nitre, which has not this effect.

f. It amalgamates with quickſilver, if the regulus, when fuſed, is put to it; but the quickſilver ought for this purpoſe to be covered with warm water: it amalgamates with it likewiſe, if the regulus of antimony be previouſly melted with an addition of lime.

Antimony is found in the earth.

A. Native. *Regulus antimonii nativus.*

This is of a ſilver colour, and its texture is compoſed of pretty large ſhining planes.

This kind was found in Carls Ort, in the mine of Salberg, about the end of the laſt century; and ſpecimens thereof have been preſerved in collections under the name of an arſenical pyrites, until the mine-maſter Mr Von Swab diſcovered its real nature, in a treatiſe he communicated to the Royal Academy of Sciences at Stockholm in the year 1748. Among other remarkable obſervations in this treatiſe, it is ſaid, firſt, That this native antimony eaſily amalgamated with quickſilver; doubtleſs, becauſe it was imbedded in limeſtone; ſince, according to Mr Pott's experiments, an artificial regulus of antimony may, by means of lime, be diſpoſed to an amalgamation: Secondly, That when brought in form of a calx, is ſhot into cryſtals during the cooling.

B. Mineraliſed antimony.

(1.) With ſulphur.

This is commonly of a radiated texture, compoſed of long wedge-like flakes or plates; it is nearly of a lead-colour, and rough to the touch.

a. Of coarſe fibres.
b. Of ſmall fibres.
c. Steel-grained, from Saxony and Hungary.
d. Cryſtalliſed, from Hungary.

1. Of priſmatical, or of a pointed pyramidal figure, in which laſt circumſtance the points are concentrical.

Cronſtedt mentions a ſpecimen of this, in which the cryſtals were covered with very minute cryſtals or quartz, except at the extremities, where there was always a little hole: this ſpecimen was given for a *flos ferri* ſpar.

(2.) With ſulphur and arſenic. Red antimony ore; *Antimonium ſolare*.

This is of a red colour, and has the ſame texture with the preceding, though its fibres are not ſo coarſe.

Semi-metals. Antimony.

a. With ſmall fibres.

b. With abrupt broken fibres, from Braunſdorff in Saxony, and from Hungary.

All antimonial ores are ſomewhat arſenical, but this is more ſo than the preceding kinds.

(3.) With ſulphurated ſilver. Plumoſe ſilver-ore, or *federertz* of the Germans.

(4.) With ſulphurated ſilver, copper, and arſenic; the *dal fahl-ertz* of the Germans.

(5.) With ſulphurated lead; radiated lead-ore.

(6.) By the aerial acid.

This ore was lately diſcovered by Mongez, among thoſe of native antimony from the mine of Chalanges in Dauphiny. It conſiſts of a group of white cryſtalliſed filaments of a needle-form appearance, diverging from a common centre, like zeolite. They are inſoluble in nitrous acid; and, on being urged by the flame of a blow-pipe, upon a piece of charcoal, they are diſſipated into white fumes, or antimonial flowers, without any ſmell of arſenic; from whence it follows, that theſe needle-formed cryſtals are a pure calx of antimony, formed by its combination with, or mineraliſed by, the aerial acid. See *Kirwan*, p. 325, and *Journal de Phyſique* for July 1787, p. 67.

Uſes, &c. By the name of *antimony* is commonly underſtood the crude antimony (which is compounded of the metallic part and ſulphur) as it is melted out of the ore; and by the name of *regulus*, the pure ſemimetal.

1. Though the regulus of antimony is a metallic ſubſtance, of a conſiderably bright white colour, and has the ſplendor, opacity, and gravity of a metal, yet it is quite unmalleable, and falls into powder inſtead of yielding or expanding under the hammer; on which account it is claſſed among the ſemimetals.

2. Regulus of antimony is uſed in various metallic mixtures, as for printing types, metallic ſpeculums, &c. and it enters into the beſt ſort of pewter ware.

3. It mixes with, and diſſolves various metals; in particular it affects iron the moſt powerfully; and what is very remarkable, when mixed together, the iron is prevented from being attracted by the loadſtone.

4. It affects copper next, then tin, lead, and ſilver; promoting their fuſion, and rendering them all brittle and unmalleable: but it will neither unite with gold nor mercury; though it may be made to combine with this laſt by the interpoſition of ſulphur. In this caſe it reſembles the common Æthiops, and is thence called *antimonial Æthiops*.

5. Regulus of antimony readily unites with ſulphur and forms a compound of a very faint metallic ſplendor: it aſſumes the form of long needles adhering together laterally: it uſually formed naturally alſo in this ſhape. This is called *crude antimony*.

6. But though antimony has a conſiderable affinity to ſulphur; yet all the metals, except gold and mercury, have a greater affinity to that compound. If therefore iron, copper, lea[illegible] or tin, be melted wit[illegible] antimony, the ſulphur [illegible] unite with the metal, and be ſeparated from [illegible] regulus, which, however, takes up ſome part of the metal, for which reaſon it is called *martial regulus*, *regulus veneris*, &c.

7. When gold is mixed, or debaſed by the mixture of other metals, it may be fuſed with antimony; for the ſulphur combines with the baſe metals, which, being the lighter, riſe up into ſcoria, while the regulus remains united at the bottom with the gold; which being urged by a ſtronger degree of heat, is freed from the ſemimetal, which is very volatile. This method of refining gold is the eaſieſt of all.

8. But the moſt numerous purpoſes to which this metal has been applied are thoſe of the chemical and pharmaceutical preparations. Lemery, in his Treatiſe on Antimony, deſcribes no leſs than 200 proceſſes and formulæ; among which there are many good and many uſeleſs ones. The following deſerve to be mentioned on account of their utility.

9. Antimony melts as ſoon as it is moderately red hot, but cannot ſuſtain a violent degree of fire, as it is thereby diſſipated into ſmoke and white vapours, which adhere to ſuch cold bodies as they meet with, and are collected into a kind of farina or powder, called *flowers of antimony*.

10. If it be only moderately heated, in very ſmall pieces, ſo as not to melt, it becomes calcined into a greyiſh powder deſtitute of all ſplendor, called *calx of antimony*. This calx is capable of enduring the moſt violent fire; but at laſt it will run into a glaſs of a reddiſh-yellow colour, ſimilar to that of the hyacinth. The infuſion made of this coloured antimonial glaſs, in acidulous wine (ſuch as that of Bourdeaux) for the ſpace of 5 or 6 hours, is a very violent emetic.

11. If equal parts of nitre and regulus of antimony be deflagrated over the fire, the grey calx which remains is called *liver of antimony*.

12. If regulus of antimony be melted with two parts of fixed alkali, a maſs of a reddiſh-yellow colour is produced, which being diſſolved in water, and any acid being afterwards added, a precipitate is formed of the ſame colour, called *golden ſulphur of antimony*.

13. Fixed nitre, viz. the alkaline ſalt that remains after the deflagration of nitre, being boiled with ſmall pieces of regulus of antimony, the ſolution becomes reddiſh; and, on cooling, depoſits the antimony in the form of a red powder, called *mineral kermes*.

14. Equal parts of the glaſs, and of the liver of antimony, well pulveriſed and mixed with an equal quantity of pulveriſed cream of tartar, being put into as much water as will diſſolve the cream of tartar, and boiled for 12 hours, adding now and then ſome hot water to replace what is evaporated, the whole is to be filtered while hot; then being evaporated to dryneſs, the ſaline matter that remains is the emetic tartar.

15. The regulus of antimony being pulveriſed, and

diſtilled with corroſive ſublimate of mercury, a thick white matter is produced, which is extremely corroſive, and is called *butter of antimony*. This thick ſubſtance may be rendered limpid and fluid by repeated diſtillations.

16. On mixing the nitrous acid with this butter of antimony, a kind of aqua regia is diſtilled, called *bezoardic ſpirit of nitre*.

17. The white matter that remains from this laſt diſtillation may be rediſtilled with freſh nitrous acid; and the remainder being waſhed with water, is called *bezoar mineral*, which is neither ſo volatile nor ſo cauſtic as the antimonial butter. This butter being mixed with water, a precipitate falls to the bottom, which is very improperly called *mercurius vitæ*, for it is in fact a very violent emetic.

18. But if, inſtead of the regulus, crude antimony be employed, and the ſame operation be performed, the reguline part ſeparates from the ſulphur, unites to the mercury, and produces the ſubſtance which is called *cinnabar of antimony*.

19. Crude antimony being projected in a crucible, in which an equal quantity of nitre is fuſed, detonates; is calcined, and forms a compound called by the French *fondant de Retrou*, or *antimoine diaphoretique non lavé*. This being diſſolved in hot water, falls to the bottom after it is cold; and after decantation is known, when dry, by the name of *diaphoretic antimony*. This preparation excites animal perſpiration, and is a good ſudorific. The ſame preparation may be more expeditiouſly made by one part of antimony with two and a half of nitre, mixed together and deflagrated: the reſidue of which is the mere calx of antimony, void of all emetic power.

20. And if the detonation be performed in a tubulated retort, having a large receiver, containing ſome water adapted to it, both a clyſſus of antimony and the antimonial flowers may be obtained at the ſame time, as Neumann aſſerts.

21. When nitre is deflagrated with antimony over the fire, the alkaline baſis of the nitre unites with the calx of the ſemimetal, which may be ſeparated by an acid, and is called *materia perlata*. See farther the article ANTIMONY; alſo METALLURGY, Part II. ſect. ix.

IV. Arſenic. In its metallic form, is,

a. Nearly of the ſame colour as lead, but brittle, and changes ſooner its ſhining colour in the air, firſt to yellow, and afterwards to black.

b. It appears laminated in its fractures, or where broken.

c. Is very volatile in the fire, burns with a ſmall flame, and gives a very diſagreeable ſmell like garlic.

d. It is, by reaſon of its volatility, very difficult to be reduced, unleſs it is mixed with other metals: However, a regulus may be got from the white arſenic, if it is quickly melted with equal parts of pot aſhes and ſoap; but this regulus contains generally ſome cobalt, moſt of the white arſenic being produced from the cobalt ores during their calcination. The white arſenic, mixed with a phlogiſton, ſublimes likewiſe into octaedral cryſtals of a metallic appearance, whoſe ſpecific gravity is 8,308.

e. The calx of arſenic, which always, on account of its volatility, muſt be got as a ſublimation, is white, and eaſily melts to a glaſs, whoſe ſpecific gravity is 5,000. When ſulphur is blended in this calx, it becomes of a yellow, orange, or red colour; and according to the degrees of colour is called *orpiment* or yellow arſenic; *ſandarach*, *realgar*, or red arſenic; and alſo *rubinus arſenici*.

f. This calx and glaſs are diſſoluble in water, and in all liquids; though not in all with the ſame facility. In this circumſtance arſenic reſembles the ſalts; for which reaſon it alſo might be ranked in that claſs.

g. The regulus of arſenic diſſolves in ſpirit of nitre; but as it is very difficult to have it perfectly free from other metals, it is yet very little examined in various menſtrua.

h. It is poiſonous, eſpecially in form of a pure calx or glaſs: But probably it is leſs dangerous when mixed with ſulphur, ſince it is proved by experience, that the men at mineral works are not ſo much affected by the ſmoke of this mixture as by the ſmoke of lead, and that ſome nations make uſe of the red arſenic in ſmall doſes as a medicine.

i. It unites with all metals, and is likewiſe much uſed by nature itſelf to diſſolve, or, as we term it, to *mineraliſe*, the metals, to which its volatility and diſſolubility in water muſt greatly contribute. It is likewiſe moſt generally mixed with ſulphur.

k. It abſorbs or expels the phlogiſton, which has coloured glaſſes, if mixed with them in the fire.

Arſenic is found,

[1.] Native; called *Scherbencobolt* and *Fliegenſtein* by the Germans.

It is of a lead colour when freſh broken, and may be cut with a knife, like black lead, but ſoon blackens in the air. It burns with a ſmall flame, and goes off in ſmoke.

- *A*. Solid and teſtaceous; *Scherbencobolt*.
- *B*. Scaly.
- *C*. Friable and porous; *Fliegenſtein*.
  - (1.) With ſhining fiſſures.
    This is by ſome called *Spigel cobalt*.

[2.] In form of a calx.

- *A*. Pure, or free from heterogeneous ſubſtances.
  - 1. Looſe or powdery.
  - 2. Indurated, or hardened. This is found in form of white ſemi-tranſparent cryſtals.
- *B*. Mixed.
  - A. With ſulphur.
    - 1. Hardened.
      - *a*. Yellow. Orpiment; *Auripigmentum*.
      - *b*. Red. Native realgar, or ſandarach.
  - B. With the calx of tin, in the tin-grains.
  - C. With ſulphur and ſilver; in the *rothgulden* or red ſilver ore.
  - D. With calx of lead, in the lead-ſpar.
  - E. With calx of cobalt, in the efflorescence of cobalt.

[3.] Mineraliſed.

A. With ſulphur and iron. Arſenical pyrites or marcaſite. Theſe kinds in Cornwall are called *ſilvery* or *white mundics* and *plate mundics*.

This alone produces red arſenic when calcined. It is of a deeper colour than the following.

B. With iron only. This differs with regard to its particles; being,
  1. Steel-grained.
  2. Coarſe-grained.
  3. Cryſtalliſed.
    a. In an octoedral figure. This is the moſt common kind.
    b. Priſmatical. The ſulphureous marcaſite is added to this kind when red arſenic is to be made; but in Sweden it is ſcarcer than the ſulphureous arſenical pyrites.

C. With cobalt, almoſt in all cobalt ores.

D. With ſilver.
E. With copper.
F. With antimony.
} See under *Silver*, *Copper*, and *Antimony*, *ſupra*.

For the *Uſes of Arſenic*, ſee the detached article Arsenic, and Chemistry-*Index*; alſo Metallurgy, Part II. ſect. xiii. and Part III. ſect. viii.

V. Cobalt.

This ſemimetal is,

a. Of a whitiſh grey colour, nearly as fine-tempered ſteel.

b. Is hard and brittle, and of a fine-grained texture; hence it is of a duſky, or not ſhining appearance.

c. Its ſpecific gravity to water is 6000 to 1000.

d. It is fixed in the fire, and becomes black by calcination: it then gives to glaſſes a blue colour, inclining a little to violet, which colour, of all others, is the moſt fixed in fire.

e. The concentrated oil of vitriol, aquafortis, and aqua-regia, diſſolve it; and the ſolutions become red. The cobalt calx is likewiſe diſſolved by the ſame menſtrua, and alſo by the volatile alkali and the ſpirit of ſea ſalt.

f. When united with the calx of arſenic in a ſlow (not a briſk) calcining heat, it aſſumes a red colour: the ſame colour is naturally produced by way of effloreſcence, and is then called the *bloom* or *flowers of cobalt*. When cobalt and arſenic are melted together in an open fire, they produce a blue flame.

g. It does not amalgamate with quickſilver by any means hitherto known.

h. Nor does it mix with biſmuth, when melted with it, without addition of ſome medium to promote their union.

[1.] Native cobalt. Cobalt with arſenic and iron in a metallic form.

Pure native cobalt has not yet been found: that which paſſes for ſuch, according to Kirwan, is mineraliſed by arſenic. Bergman, however, in his Sciagraphia, has entered this preſent ore under the denomination of *native cobalt:* and certain it is, that among all the cobaltic ores, this is the neareſt to the native ſtate of this ſemimetal. It always contains a ſmall quantity of iron, beſides the arſenic, by which it is mineraliſed.

This is of a dim colour when broken, and not unlike ſteel. It is found,

a. Steel-grained, from Loos in the pariſh of Farila in the province of Helſingeland, and Schneeberg in Saxony.

b. Fine-grained, from Loos.

c. Coarſe-grained.

d. Cryſtalliſed:
  1. In a denditrical or arboreſcent form;
  2. Polyhedral, with ſhining ſurfaces;
  3. In radiated nodules.

[2.] Calciform cobalt. Cobalt is moſt commonly found in the earth mixed with iron.

A. In form of a calx.

1.) With iron without arſenic.
  a. Looſe or friable; cobalt ochre. This is black, and reſembles the artificial zaffre.
  b. Indurated: *Minera cobalti vitrea*. The ſchlacken or ſlag cobalt. This is likewiſe of a black colour, but of a glaſſy texture, and ſeems to have loſt that ſubſtance which mineraliſed it, by being decayed or weathered.

1.) With arſenical acid; cobalt-blut, Germ. *Ochra cobalti rubra;* bloom, flowers, or effloreſcence of cobalt.
  a. Looſe or friable. This is often found of a red colour like other earths, ſpread very thin on the cobalt ores; and is, when of a pale colour, erroneouſly called *flowers of biſmuth*.
  b. Indurated. This is commonly cryſtalliſed in form of deep red ſemitranſparent rays or radiations: It is found at Schneeberg in Saxony.

B. Mineraliſed.

1.) With ſulphurated iron.

This ore is of a light colour, nearly reſembling tin or ſilver. It is found cryſtalliſed in a polygonal form.
  a. Of a ſlaggy texture.
  b. Coarſe-grained.

This ore is found in Baſtnaſgrufva at Raddarſhyttan in Weſtmanland, and diſcovers not the leaſt mark of arſenic. The coarſe-grained becomes ſlimy in the fire, and ſticks to the ſtirring hook during the calcination in the ſame manner as many regules do: It is a kind of regule prepared by nature. Both theſe give a beautiful colour.

2.) With ſulphur, arſenic, and iron. This reſembles the arſenicated cobalt ore, being only rather of a whiter or lighter colour. It is found,
  a. Coarſe-grained.
  b. Cryſtalliſed;
    1. In a polygonal figure, with ſhining ſurfaces, or *glanzkobolt*. It is partly of a white or light colour, and partly of a ſomewhat reddiſh yellow.

Semi-metals. Nickel.

(3.) With ſulphurated and arſenicated nickel and iron; ſee *Kupfer-nickel*, below.

Uſes, &c. See the article Cobalt. See alſo Chemistry-*Index*; and Metallurgy, Part II. ſect. xi.

VI. Nickel; *Nicolum*. This is the lateſt diſcovered ſemimetal. It was firſt deſcribed by its diſcoverer Mr Cronſtedt, in the Acts of the Royal Academy of Sciences at Stockholm for the years 1751 and 1754, where it is ſaid to have the following qualities:

1. It is of a white colour, which, however, inclines ſomewhat to red.
2. Of a ſolid texture and ſhining in its fractures.
3. Its ſpecific gravity to water is as 8,500 to 1000.
4. It is pretty fixed in the fire; but, together with the ſulphur and arſenic, with which its ore abounds, it is ſo far volatile, as to riſe in form of hairs and branches, if in the calcination it is left without being ſtirred.
5. It calcines to a green calx.
6. The calx is not very fuſible, but, however, tinges glaſs of a tranſparent reddiſh-brown or jacinth colour.
7. It diſſolves in aqua-fortis, aqua-regia, and the ſpirit of ſea-ſalt; but more difficultly in the vitriolic acid, tinging all theſe ſolutions of a deep green colour. Its vitriol is of the ſame colour; but the colcothar of this vitriol, as well as the precipitates from the ſolutions, become by calcination of a light green colour.
8. Theſe precipitates are diſſolved by the ſpirit of ſal ammoniac, and the ſolution has a blue colour; but being evaporated, and the ſediment reduced, there is no copper, but a nickel regulus is produced.
9. It has a ſtrong attraction to ſulphur; ſo that when its calx is mixed with it, and put on a ſcorifying teſt under the muffle, it forms with the ſulphur a regule: this regule reſembles the yellow ſteel-grained copper-ores, and is hard and ſhining in its convex ſurface.
10. It unites with all the metals, except quickſilver and ſilver. When the nickel regulus is melted with the latter, it only adheres cloſe to it, both the metals lying near one another on the ſame plane; but they are eaſily ſeparated with a hammer. Cobalt has the ſtrongeſt attraction to nickel, after that of iron, and then to arſenic. The two former cannot be ſeparated from one another but by their ſcorification; which is eaſily done, ſince,
11. This ſemimetal retains its phlogiſton a long time in the fire, and its calx is reduced by the help of a very ſmall portion of inflammable matter: it requires, however, a red heat before it can be brought into fuſion, and melts a little ſooner, or almoſt as ſoon, as copper or gold, conſequently ſooner than iron.

Nickel is found.

A. Native.

This is mentioned by Mr Rinman to have been lately met with in a mine of cobalt in Heſſe. It is very heavy, and of a liver colour, that is, dark red. When pulveriſed and roaſted under a muffle, it forms green excreſcences, and ſmokes; but its ſmoke has no particular ſmell: and no ſublimate, whether ſulphureous or arſenical, can be caught. It is ſoluble in acids, and the ſolution is green; but a poliſhed iron plate diſcovers no copper.

Semi-metals. Manganeſe.

B. In form of a calx. Nickel ochre, aerated nickel.

1. Mixed with the calx of iron. This is green, and is found in form of flowers on kupfernickel.

C. Mineraliſed.

1. With ſulphurated and arſenicated iron and cobalt; *Kupfernickel*. This is of a reddiſh yellow colour; and is found,
   - *a*. Of a flaggy texture.
   - *b*. Fine-grained; and
   - *c*. Scaly. Theſe two are often from their colour confounded with the liver-coloured marcaſite.
2. With the acid of vitriol. This is of a beautiful green colour, and may be extracted out of the nickel ochre, or efflorescence of the Kupfernickel.

For a full account of this ſemimetal, ſee the article. Nickel, and Chemistry-*Index*.

VII. Manganeſe. *Manganeſium*.

The ores of this kind are in Swediſh called *brunſten*; in Latin *ſydereæ*, or *magneſia nigra*, in order to diſtinguiſh them from the *magneſia alba officinalis*; and in French *manganeſe*, &c.

1. Manganeſe conſiſts of a ſubſtance which gives a colour both to glaſſes and to the ſolutions of ſalts, or, which is the ſame thing, both to dry and to liquid menſtrua, viz.
   - *a*. Borax, which has diſſolved manganeſe in the fire, becomes tranſparent, of a reddiſh brown or hyacinth colour.
   - b. The microcoſmic ſalt becomes tranſparent with it, of a crimſon colour, and moulders in the air.
   - *c*. With the fixed alkali, in compoſitions of glaſs, it becomes violet; but if a great quantity of manganeſe is added, the glaſs is in thick lumps, and looks black.
   - *d*. When ſcorified with lead, the glaſs obtains a reddiſh brown colour.
   - *e*. The lixivium of deflagrated manganeſe is of a deep red colour.
2. It deflagrates with nitre, which is a proof that it contains ſome phlogiſton.
3. When reckoned to be light, it weighs as much as an iron ore of the ſame texture.
4. When melted together with vitreous compoſitions, it ferments during the ſolution: but it ferments in a ſtill greater degree when it is melted with the microcoſmic ſalt.
5. It does not excite any efferveſcence with the nitrous acid: aqua-regia, however, extracts the colour out of the black manganeſe, and diſſolves likewiſe a great portion of it, which by means of an alkali is precipitated to a white powder.

6. Such

Semi-metals. Molybdena.

6. Such colours as are communicated to glaſſes by manganeſe, are eaſily deſtroyed by the calx of arſenic or tin: they alſo vaniſh of themſelves in the fire.

7. It is commonly of a looſe texture, ſo as to colour the fingers like ſoot, though it is of a metallic appearance when broken.

Manganeſe is found,

[1.] Native; of the diſcovery and qualities of which, an account is given under the article Manganese in its alphabetical order. See alſo Chemistry-*Index*.

[2.] Calciform.

A. Looſe and friable.

a. Black; which ſeems to be weathered or decayed particles of the indurated kind.

B. Indurated.

1.) Pure, in form of balls, whoſe texture conſiſts of concentric fibres. *Pura ſphærica radiis concentratis.*

a. White; very ſcarce.

2.) Mixed with a ſmall quantity of iron.

a. Black manganeſe, with a metallic brightneſs. This is the moſt common kind, and is employed at the glaſs-houſes and by the potters. It is found,

1. Solid, of a ſlaggy texture.
2. Steel-grained.
3. Radiated.
4. Cryſtalliſed, in form of coherent hemiſpheres.

VIII. Molybdena.

A. Lameller and ſhining, its colour ſimilar to that of the potter's lead ore.

This ſubſtance reſembles plumbago or black-lead; and has long been confounded with it, even by Cronſtedt. But it poſſeſſes very different properties; in particular,

1. Its laminæ are larger, brighter: and, when thin, ſlightly flexible. They are of an hexagonal figure.

2. It is of a lead colour, and does not ſtrike fire with hard ſteel.

3. Its ſpecific gravity is = 4,569, according to Kirwan; and 4,7385, according to Briſſon.

4. When rubbed on white paper, it leaves traces of a dark brown or bluiſh colour, as the plumbago or black lead does; but they are rather of an argentine gloſs; by which circumſtance the molybdena, according to Dr d'Arcet, may be eaſily diſtinguiſhed from black-lead, as the traces made by this laſt are of a leſs brilliant, and of a deeper tinge.

5. In an open fire, it is almoſt entirely volatile and infuſible. Microcoſmic ſalt or borax ſcarcely affect it; but it is acted upon with much effervefcence by mineral alkali, and forms with it a reddiſh maſs, which ſmells of ſulphur.

6. It conſiſts of an acid of peculiar nature (ſee Chemistry-*Index.*) united to ſulphur. A ſmall proportion of iron is commonly found in it, but this ſeems merely fortuitous: 100 parts of molybdena contain about 45 of this acid and 55 of ſulphur.

Semi-metals. Wolfram.

7. It is decompoſed either by detonation with nitre, or by ſolution in nitrous acid.

8. This acid is ſoluble in 570 times its weight of water in the temperature of 60; the ſolution reddens that of litmus, precipitates ſulphur from the ſolution of liver of ſulphur, &c. The ſpecific gravity of the dry acid is 3,460.

9. This acid is precipitable from its ſolution in water by the Pruſſian alkali, and alſo by tincture of galls: the precipitate is reddiſh brown.

10. If this acid be diſtilled with three times its weight of ſulphur, it reproduces molybdena.

11. The ſolution of this acid in water unites to fixed alkalies, and forms cryſtalliſable ſalts; as it alſo does with calcareous earth, magneſia, and argil: theſe laſt combinations are difficultly ſoluble. It acts alſo on the baſe metals, and with them aſſumes a bluiſh colour.

12. This ſolution precipitates ſilver, mercury, or lead, from the nitrous acid, and lead from the marine, but not mercury.

13. It alſo precipitates barytes from the nitrous and marine acids, but no other earth. Molybdenous baroſelenite is ſoluble in cold water.

14. This acid is itſelf ſoluble in the vitriolic acid by the aſſiſtance of heat; and the ſolution is blue when cold, though colourleſs while hot; it is alſo ſoluble in the marine acid, but not in the nitrous.

15. Molybdena tartar and ammoniac precipitate all metals from their ſolutions by a double affinity. Gold, ſublimate corroſive, zinc, and manganeſe, are precipitated white; iron or tin, from the marine acid, brown; cobalt, red; copper, blue; alum and calcareous earth, white.

16. This acid has been lately reduced by Mr Hielm; but the properties of the regulus thus obtained are not yet publiſhed.

17. Mr Pelletier obtained alſo the regulus or molybdena, by mixing its powder with oil into a paſte, and expoſing it with powdered charcoal in a crucible to a very violent fire for two hours. See Chemistry-*Index*, n° 14, 97.

18. This ſemimetal being urged by a ſtrong fire for an hour, produces a kind of ſilvery flowers, like thoſe of antimony.

19. Molybdena is ſaid to be ſoluble in melted ſulphur; which ſeems highly probable, as ſulphur is one of its component parts.

See Farther the article Molybdena, and Chemistry-*Index*.

IX. Wolfram. *Wolfranum*, *Spuma Lupi*, Lat. See the detached article Wolfram.

This mineral has the appearance of manganeſe, blended with a ſmall quantity of iron and tin.

1. With coarſe fibres.

a. Of an iron-colour, from Altenberg in Saxony. This gives to the glaſs compoſitions, and alſo to borax and the microcoſmic ſalt, an opaque whitiſh yellow colour, which at laſt vaniſhes.

X. Siderite. } See thoſe words in the order of the
XI. Saturnite. } alphabet.

Ap-

APPENDIX.

Of Saxa and Petrifactions.

THOUGH the *Saxa*, and foſſils commonly called *Petrifactions*, cannot, in ſtrictneſs, be ranked in a mineral ſyſtem, for the reaſons formerly given; yet as theſe bodies, eſpecially the latter, occupy ſo conſiderable a place in moſt mineral collections, and the former muſt neceſſarily be taken notice of by the miners in the obſervations they make in ſubterranean geography, it appeared proper to ſubjoin them in ſuch an order as might anſwer the purpoſe for which they are regarded by miners and mineralogiſts.

Order I. Saxa. *Petræ.*

Theſe may be divided into two kinds.

1. Compound ſaxa, are ſtones whoſe particles, conſiſting of different ſubſtances, are ſo exactly fitted and joined together, that no empty ſpace, or even cement, can be perceived between them; which ſeems to indicate, that ſome, if not all, of theſe ſubſtances have been ſoft at the inſtant of their union.

2. Conglutinated ſtones, are ſtones whoſe particles have been united by ſome cementitious ſubſtance, which, however, is ſeldom perceivable, and which often has not been ſufficient to fill every ſpace between the particles: in this caſe the particles ſeem to have been hard, worn off, and in looſe, ſingle, unfigured pieces, before they were united.

I. Compound ſaxa.

- *A. Ophites.* Scaly limeſtone with kernels or bits of ſerpentine ſtone in it.
  - 1. *Kolmord marble.* It is white and green.
  - 2. *Serpentino antico*, is white, with round pieces of black ſteatites in it. This muſt not be confounded with the *ſerpentino verde antico.*
  - 3. The *Haraldſio marble.* White, with quadrangular pieces of a black ſteatites.
  - 4. The *marmor pozzevera di Genova.* Dark green marble, with white veins. This kind receives its fine poliſh and appearance from the ſerpentine ſtone.
- *B. Stellſten* or *geſtelſtein.* Granitello.
  - 1. Of diſtinct particles. In ſome of theſe the quartzoſe particles predominate, and in others the micaceous: in the laſt caſe it is commonly ſlaty, and eaſy to ſplit.
  - 2. Of particles which are wrapt up in one another.
    - *a.* Whitiſh grey.
    - *b.* Greeniſh.
    - *c.* Reddiſh.
- *C. Norrka. Murkſten* of the Swedes. *Saxum compoſitum mica, quartzo, et granato.*
  - 1. With diſtinct garnets or ſhirl.
    - *a.* Light grey.
    - *b.* Dark grey.
    - *c.* Dark grey, with priſmatical, radiated, or fibrous cockle or ſhirl.
  - 2. With kernels of garnet-ſtone.
    - *a.* Of pale red garnet ſtone.

  The firſt of this kind, whoſe ſlaty ſtrata makes it commonly eaſy to be ſplit, is employed for mill-ſtones, which may without difficulty be accompliſhed, if ſand is firſt ground with them; becauſe the ſand wearing away the micaceous particles on the ſurfaces, and leaving the garnets predominant, renders the ſtone fitter for grinding the corn.
- *D.* The whetſtone, *Cos. Saxum compoſitum mica, quartzo, et forſan argilla martiali in nonnullis ſpeciebus.*
  - 1. Of coarſe particles.
    - *a.* White.
    - *b.* Light grey.
  - 2. Of fine particles.
    - *a.* Liver-brown colour.
    - *b.* Blackiſh grey.
    - *c.* Light grey.
    - *d.* Black. The table-ſlate, or that kind uſed for large tables and for ſchool ſlates.
  - 3. Of very minute and cloſely combined particles. The Turkey-ſtone *. This is of an olive colour, and ſeems to be the fineſt mixture of the firſt ſpecies of this genus. The beſt of this ſort come from the Levant, and are pretty dear. The whetſtone kinds, when they ſplit eaſily and in thin plates, are very fit to cover houſes with, though moſt of them are without thoſe properties.

  * See V. (p. 86. col. 1.)
- *F.* Porphyry; *Porphyrites.* Italorum *porfido. Saxum compoſitum jaſpide et feltſpato, interdum mica et baſalte* (D). See the article Porphyry.
  - *a.* Its colour is green, with light-green feltſpat, *Serpentino verde antico.* It is ſaid to have been brought from Egypt to Rome, from which latter place the ſpecimens of it now come.
  - *b.* Deep red, with white feltſpat.
  - *c.* Black, with white and red feltſpat.
  - *d.* Reddiſh brown, with light red and white feltſpat.
  - *e.* Dark grey, with white grains of feltſpat alſo. The dark red porphyry has been moſt employed for ornaments in building; yet it is not the only one known by the name

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(D) Great part of the hill of Bineves in Lochaber is compoſed of a kind of porphyry. It is remarkably fine, beautiful, and of an elegant reddiſh colour; "in which (ſays Mr Williams) the pale roſe, the bluſh, and the yellowiſh white colours, are finely blended and ſhaded through the body of the ſtone; which is of a jelly like texture, and is undoubtedly one of the fineſt and moſt elegant ſtones in the world. On this hill alſo is found a kind of porphyry of a greeniſh colour, with a tinge of browniſh red. It is ſmooth, compact, and heavy; of a cloſe uniform texture, but has no brightneſs when broken. It has angular ſpecks in it of a white quartzy ſubſtance."

name of *perfido*, the Italians applying the ſame name alſo to the black kind.

G. The *trapp* of the Swedes. *Saxum compoſitum jaſpide martiali molli, ſeu argilla martiali indurata.* See the article Trapp.

This kind of ſtone ſometimes conſtitutes or forms whole mountains; as, for example, the mountain called *Hunneberg* in the province of Weſtergotland, and at Drammen in Norway; but it is oftener found in form of veins in mountains of another kind, running commonly in a ſerpentine manner, contrary or acroſs to the direction of the rock itſelf. It is not homogeneous, as may be plainly ſeen at thoſe places where it is not preſſed cloſe together; but where it is preſſed cloſe it ſeems to be perfectly free from heterogeneous ſubſtances.—When this kind is very coarſe, it is interſperſed with feltſpat; but it is not known if the finer ſorts likewiſe contain any of it. Beſides this, there are alſo ſome fibrous particles in it, and ſomething that reſembles a calcareous ſpar; this, however, does not ferment with acids, but melts as eaſy as the ſtone itſelf, which becomes a black ſolid glaſs in the fire. By calcination it becomes red, and yields in aſſays 12 or more *per cent.* of iron. No other ſort of ore is to be found in it, unleſs now and then ſomewhat merely ſuperficial lies in its fiſſures; for this ſtone is commonly, even to a great depth in the rock, cracked in acute angles, or in form of large rhomboidal dice. It is employed at the glaſs houſes, and added to the compoſition of which bottles are made. In the air it decays a little, leaving a powder of a brown colour; it cracks commonly in the fire, and becomes reddiſh brown if made red-hot. It is found,

1. Of coarſe chaffy particles.
   a. Dark grey.
   b. Black.
2. Coarſe-grained.
   a. Dark grey.
   b. Reddiſh.
   c. Deep brown.
3. Of fine imperceptible particles.
   a. Black. The touchſtone; *Lapis lydius.*
   b. Bluiſh.
   c. Grey.
   d. Reddiſh.

The black variety (3. *a.*) is ſometimes found ſo compact and hard, as to take a poliſh like the black agate: it melts, however, in the fire to a black glaſs; and is, when calcined, attracted by the load-ſtone.

H. Amygdaloides. The carpolithi or fruit-ſtone rocks of the Germans.

It is a martial jaſper, in which elliptical kernels of calcareous ſpar and ſerpentine ſtone are included.

a. Red, with kernels of white limeſtone, and of a green ſteatites. This is of a particular appearance, and when calcined is attracted by the loadſtone; it decays pretty much in the air, and has ſome affinity with the trapp, and alſo with the porphyry. There are ſometimes found pieces of native copper in this ſtone.

I. The *gronſten* of the Swedes.

Its baſis is horneblende, interſperſed with mica. It is of a dark green colour, and in Smoland is employed in the iron furnaces as a flux to the bog-ore.

K. The granite. *Saxum compoſitum feltſpata, mica et quartzo, quibus accidentaliter interdum horneblende ſteatites, granatus et baſaltes immixti ſunt.* Its principal conſtituent parts are felt ſpat, or rhombic quartz, mica, and quartz. See the article Granite.

It is found,

(1.) Looſe or friable. This is uſed at the Swediſh braſs-works to caſt the braſs in, and comes from France.

(2.) Hard and compact.
   a. Red.
      1. Fine-grained;
      2 Coarſe-grained.
   b. Grey, with many and various colours (E).

II. Con-

(E) Mr Wiegleb has analyſed a ſpecies of green granite found in Saxony. The cryſtals are heaped together, and form very compact layers; the colour ſometimes an olive green, ſometimes reſembling a pear, and ſometimes of a reddiſh brown: ſome of them being perfectly tranſparent, and others nearly ſo. According to Mr Warren, they contain 25 per cent. of iron; whence they have been called green ore of iron. An ounce of theſe cryſtals heated red hot in a crucible loſt two grains in weight, and became of the colour of honey. The remainder was put into a retort, and diſtilled with marine acid, with which it evidently effervefced. The reſiduum was lixiviated with diſtilled water, freſh muriatic acid added, and the diſtillation and lixiviation repeated. The iron precipitated from this lixivium, and reduced partly to its metallic ſtate, weighed two drachms. M. Wiegleb concludes, that the ſpecimen contained two drams 26½ grains of lime. From further experiments he concludes, that 100 parts of the ſubſtance contained 36.5 of ſiliceous earth; lime 30.8; iron 28.7; and water and fixed air 4.0.

Scotland is remarkable for a great number of excellent granites, little or nothing inferior to porphyry. Of theſe the following kinds are mentioned by Mr Williams.

1. The grey granite, or *moor-ſtone* as it is called in Cornwall, is very common in this country. In ſome places it ſhows no marks of ſtrata; and in others it is diſpoſed in thick unwieldly irregular beds, which are commonly broken tranſverſely into huge maſſes or blocks of various ſizes and ſhapes. There is a great variety in this kind of ſtones; ſome of them differing but little in appearance from baſaltes; others are compoſed of almoſt equal parts of black and white grains, about the ſize of ſmall peaſe, whence it is called *peaſy whin* by the

II. Conglutinated ſaxa.

A. Of larger or broken pieces of ſtones of the ſame kinds conglutinated together. *Breccia.*

1. Of limeſtone cemented by lime.

a. Calcareous breccia; the *marmi brecciati* of the Italians.

When theſe kinds have fine colours, they are poliſhed and employed for ornaments in architecture and other œconomical uſes.

b. The *lumachella* of the Italians, or ſhell marbles. Theſe are a compound of ſhells and corals, which are petrified or changed into lime, and conglutinated with a calcareous ſubſtance. When they have many colours, they

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the common people. In Galloway and other places it frequently has a longitudinal grain, as if the component parts had been all moved one way by a gentle flow of water. When this kind of granite begins to undergo a ſpontaneous decompoſition by expoſure to the atmoſphere, we obſerve that it is compoſed of pretty large grains of the figures of cubes, rhomboids, &c. ſome of them ſo large as to deſerve the name of fragments; and the largeſt of theſe are always of quartz or feldſpath, and talc.

2. Reddiſh granite, of a gellied texture, which, Mr Williams ſays, is one of the fineſt and moſt elegant ſtones in the world. The mountains of Bineves, he ſays, are principally compoſed of this ſtone; and it is found in great abundance in many other parts of Scotland, but he never ſaw it exhibit any marks of ſtratification.

3. The fine reddiſh granites, in which ſeveral fine ſhades of colours are blended together, not ſpread out in tints as in the former. Neither this nor the former are ſtratified: "On the contrary (ſays our author), both exhibit ſuch a degree of uniform regularity, that in ſome places there is no difference between a ſtone and a mountain, excepting only in magnitude; as many mountains of granite are nothing more than one regularly uniform maſs throughout, in which not the leaſt mark of a bed is to be ſeen, nor hardly a crack or fiſſure, unleſs it be at the edge of ſome precipice or declivity. Theſe two varieties of elegant red granite are met with in the Highlands and Lowlands of Scotland, in Galloway, and many other places. We often find maſſes of talc ſo large in this ſecond variety, that ſome of them may be called fragments, not diſpoſed in any order, but higgledy-piggledy through the body of the ſtone.

4. Stratified reddiſh granite, reſembling the third in colour and quality, but not always quite ſo pure or free from admixture of other ſtony matter of a different quality. This variety frequently contains larger and ſmaller fragments of fine laminated talc. Mr Williams, however, has ſeen this kind of granite diſpoſed in pretty regular ſtrata in the ſhires of Moray and Nairn, and other parts of Scotland.

5. Granite of a white and whitiſh colour, generally of a granulated texture, containing a great quantity of mica, or ſmall-leaved talc, and the grains of quartz ſometimes large and angular. This variety is ſubject to ſpontaneous decompoſition; part frequently diſſolves and falls into lakes, in ſuch an exceedingly fine and attenuated ſtate, that it does not ſink in the water. "I have found (ſays Mr Williams) this ſubſtance in many places where water had been accidentally drained off, reſembling fine ſhell marle, only much lighter. When thoroughly dry, it is the lighteſt foſſile ſubſtance I ever handled; and, when blanched with rain, it is as white as ſnow. This variety of granite is either not ſtratified, or exhibits thick irregular beds. It frequently contains a conſiderable quantity of talc, in maſſes and ſcales too large to be called mica."

Our author is of opinion, that this fine white ſubſtance produced from the decompoſition of the granite, is the true kaolin of the Chineſe, one of the component parts of porcelain ware. "The authors of the Hiſtory of China (ſays he) informs us, that the fine procelain ware is compoſed of two different foſſile ſubſtances, called by them *petuntſe* and *kaolin*. We are further told, that the petuntſe is a fine white vitreſcible ſtone, compact and ponderous, and of conſiderable brightneſs in the inſide when broken, which they grind to a fine powder; and that the kaolin is not a ſtone, but a fine white earthy ſubſtance, not vitrifiable, at leaſt not in the heat of a common potter's furnace; that they mix the kaolin and the flour of the petuntſe together, and form a paſte of this mixture, which they mould into all ſorts of porcelain veſſels. Now, from the beſt accounts of of this matter which I have been able to obtain, after a good deal of ſearch and inquiry, it appears to me, that the ſediment which I have mentioned above is the true kaolin; and that as the fine white glaſſy quartz, which is found in irregular maſſes, and in irregular diſcontinuous veins or ribs, in ſome of the rocks of ſchiſtus, is the true petuntſe; and if this obſervation is really true, it deſerves to be remarked, that Scotland is as well furniſhed with the beſt materials for making fine porcelain as moſt countries in the world. The ſpecies of quartz which I ſuppoſe to be petuntſe is of a pure fine uniform glaſſy texture, ſemitranſparent, and of a pure ſnowy whiteneſs. A broken piece of this ſtone, and a newly broken piece of fine porcelain, are very like one another. There is a great quantity of petuntſe, or pure white quartz, in many places of Scotland, particularly in the north and Highlands. There is a conſiderable quantity of it upon the ſhore and waſhed by the tide between Banff and Cullen, generally in pretty large maſſes in rocks of bluiſh ſchiſtus; and to the beſt of my memory it is very fine of the kind. There is alſo a conſiderable quantity of it in diſcontinous ribs and maſſes, in rocks of blue ſchiſt, about three or four miles north of Callendar in Monteith, upon the ſide of the high road which runs parallel to Lochleodunich, which I think alſo very fine. In ſome places this ſort of quartz is tinged with a fleſh colour from the neighbourhood of iron, which renders it unfit for porcelain; but there is plenty to be found of a pure white in almoſt all parts of Scotland, without any mineral tinge whatever. The kaolin is perhaps as plentiful in Scotland as the petuntſe, there being many extenſive lakes eaſily drained, which contain a conſiderable depth of it; and moreover, it is to be found in many places that have been lakes, which are now laid dry by accident. There is a quantity of kaolin about they are called *marbles*, and employed for the ſame purpoſes as the preceding (F).

2. Of kernels of jaſper cemented by a jaſpery ſubſtance. *Breccia jaſpidea. Diaſpro brecciato* of the Italians.

Of this kind ſpecimens from Italy are ſeen in collections. A coarſe jaſper breccia is ſaid to be found not far from Frejus in Provence in France.

3. Of ſiliceous pebbles, cemented by a jaſpery ſubſtance,

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100 yards below the high road upon the ſouth ſide of a bridge, about a mile and a half or two miles ſouth of the inn of Aviemore in the Highlands. It lies beneath a ſtratum of peat bog, in a place which has been a lake, but is now drained by the river Spey cutting through one ſide of the mound which formed the lake.—There is more than one ſtratum of the kaolin in this place, and ſome of it is exceedingly white, eſpecially when blanched by the rain; and there is a white granite rock up the rivulet, at ſome diſtance above the bridge, the decompoſition and diſſolution of which is ſuppoſed to produce this fine and curious ſediment. Several lakes in the Highlands of Scotland are nearly full of kaolin. One of them is ſituated in the country of Stratherig in Invernefs-ſhire, leſs than a mile north of the public road, and upon the weſt ſide of the farm of Drimin. It is a pretty long lake, and there is a conſiderable depth of kaolin in it, which may be drained at a moderate expence; and, if I remember well, the granite rocks which ſurround it are pretty white and fine. If the kaolin originates from coloured granite, it is good for nothing, eſpecially if it contains the leaſt tinge of iron, becauſe this will diſcolour and ſpoil the beauty of the porcelain; but wherever white granite is found compoſed of quartz, feldſpath, and mica, without any admixture of ſhirl, and eſpecially iron, the kaolin ſhould be diligently ſought after in that neighbourhood. Lochdoon, in Galloway, is ſaid to contain a great quantity of kaolin. It was drained ſome years ago on the ſuppoſition of its containing ſhell marle; but on trying the ſubſtance contained in it, it was found not to be marle but kaolin. Theſe ſubſtances may eaſily be miſtaken for one another at firſt; but they are eaſily diſtinguiſhed by trying them with acids, the marle readily effervefcing with the weakeſt, and the kaolin not at all with the ſtrongeſt acid liquors."

6. Grey compoſite granite is a very beautiful ſtone, and when broken looks as if compoſed of ſmall fragments of various ſizes and ſhapes, not unlike calve's-head jelly. When poliſhed, the fragments appear as if ſet or inlaid in a fine pellucid or water coloured matter. There is a ſingle ſtratum of very curious compoſite granite, a little to the weſt of Loſſiemouth, in the county of Moray, in Scotland, of about ſix or eight feet thick. It is compoſed chiefly of grains and fragments of various bright and elegant colours, moſt of which are as large as peaſe and beans, all fine, hard, and ſemipellucid; there is about an eighth part of good lead ore in the compoſition of this ſtone, of the kind commonly called potter's ore; and it is likewiſe remarkable, that there is no other granite in that neighbourhood but this ſingle ſtratum, all the ſtrata above and below it being moſtly a coarſe, imperfect, grey ſand-ſtone.

7. Granite of a looſe friable texture, ſubject to ſpontaneous decompoſition, and reduction to granite gravel. There is a remarkable rock of this kind near the Queen's-ferry in Scotland, on the road to Edinburgh, which appears in prodigious thick irregular ſtrata. This rock ſeems to be compoſed chiefly of quartz, ſhirl, and ſome iron; and produces excellent materials for the high roads.

8. In many parts of the north of Scotland, in the Highlands, and in Galloway, there is found an excellent ſpecies of grey granite, compoſed chiefly of red and black coloured grains. This is a fine and very durable ſtone, very fit for all kinds of architecture.

In ſpeaking of theſe ſtones, Mr Williams obſerves, that the finer and moſt elegant red granites, and the fineſt granite-like porphyries, ſo much reſemble one another, that he does not attempt to diſtinguiſh them; and Scotland is remarkable for a great number and variety of them. "The elegant reddiſh granite of Bineves, near Fort William (ſays he), is perhaps the beſt and moſt beautiful in the world; and there is enough of it to ſerve all the kingdoms on earth, though they were all as fond of granite as ancient Egypt. There are extenſive rocks of red granite upon the ſea-ſhore to the weſt of the ferry of Ballachyliſh in Appin, and likewiſe at Strontian, as well as many other parts of Argyleſhire. I have ſeen beautiful red granite by the road ſide, near Dingwall, and in ſeveral other parts of the north of Scotland, which had been blown to pieces with gunpowder, and turned off the fields. There are extenſive rocks of reddiſh granite about Peterhead and Slains, and both of red and grey granite in the neighbourhood of Aberdeen. The hill of Cruffel in Galloway, and ſeveral lower hills and extenſive rocks in that neighbourhood, are of red and grey granite, where there are great varieties of that ſtone, and many of them excellent. Upon the ſea ſhore near Kinnedore, weſt of Loſſiemouth, in Moray, there is a bed of ſtone about eight feet thick, which I think ſhould be called a compoſite granite. It is compoſed of large grains, or rather ſmall pieces of bright and beautiful ſtones of many different colours; and all the ſtony parts are exceedingly hard, and fit to receive the higheſt poliſh. About a ſixth or eighth part of it alſo conſiſts of lead ore, of that ſpecies called potter's ore. The ſeparate ſtony parts compoſing this ſtratum are all hard, fine, ſolid, and capable of the moſt brilliant poliſh; and if ſolid blocks can be raiſed free from all cracks and blemiſhes, I imagine, from the beauty and variety of colours of the ſtony part, and the quantity of bright lead ore which is blended through the compoſition and body of the ſtone, that this would be a very curious and beautiful ſtone when poliſhed."

(F) The ſtones called *Ludi Helmontii* or *Paracelſi*, have ſome ſimilarity in their form to the *breccia*, *a. b.*: for they are compoſed of various lumps of a marly whitiſh-brown matter, ſeparated into a great number of polygonous compartments, of various ſizes, formed of a whitiſh-yellow cruſt of a red calcareous ſpar, ſometimes

Appendix.
Saxa.

ſubſtance, or ſomething like it. The plumpudding ſtone of the Engliſh; *Breccia ſilicea.* Its baſis, which at the ſame time is the cement, is yellow; wherein are contained ſingle flinty or agaty pebbles, of a grey colour or variegated. This is of a very elegant appearance when cut and poliſhed: it is found in England and Scotland (G).

4. Of quartzoſe kernels combined with an unknown cement. *Breccia quarzoſa.*
5. Of kernels of ſeveral different kinds of ſtones. *Breccia ſaxoſa.*

a. Of kernels of porphyry, cemented by a porphyry or coarſe jaſpery ſubſtance; *Breccia porphyrea.*

b. Of kernels of ſeveral ſaxa; *Breccia indeterminata.*

c. Of conglutinated kernels of ſandſtone; *Breccia arenacea.* This kind conſiſts of ſandſtone kernels, which have been combined a ſecond time together.

The abovementioned brecciæ of themſelves muſt demand the diſtinctions here made between, but which perhaps may ſeem to be carried too far,

Appendix.
Saxa.

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times pyritous, which often riſe a little above the external ſurface, and incloſe each of them on the inſide. According to Bomare, the *ludus ſtellatus helmontii,* found in the county of Kent, is covered with a kind of ſtriated ſelenite reſembling the zeolite. They are for the moſt part of a globoſe figure, ſeldom flat, but often convex on the outſide; and ſometimes with a concave ſurface.

According to Wallerius, the *ludus helmontii* loſes by calcination about half of its weight; and, on being urged by fire, is melted into a black glaſſy ſlag. It efferveſces ſtrongly with aqua-fortis, and this ſolution is of a yellow colour. But what ſeems very extraordinary, by adding to it ſome oil of tartar *per deliquium,* bubbles are produced, from which a great number of ſlender black threads or filaments are produced, ſticking like a cobweb to the ſides and bottom of the veſſel.

Theſe ſtones are found quite ſeparate by themſelves, as well as various ſtalagmites and cruſtaceous bodies, on the ſtrata of argillaceous earth, in various parts of Europe, chiefly in Lorrain, Italy, England (in the counties of Middleſex and Kent), and elſewhere.

Wallerius ranges the *ludus helmontii* among the *tophi,* in the Spec. 425. of his ſyſtem of Mineralogy. Paracelſus had attributed to theſe ſtones a lithontriptic power, and Dr Grew ſays that they are diuretic; but there is not the leaſt proof of their really poſſeſſing ſuch qualities.

(G) The breccia ſtratum, or plumpudding-rock, exhibits a ſingular appearance as it lies in the ground; being compoſed of water-rounded ſtones of all qualities and of all ſizes, from ſmall gravel up to large rounded ſtones of ſeveral hundreds weight each; the interſtices being filled up with lime and ſand. It frequently alſo contains lime and iron. Sometimes it exhibits a groteſque and formidable appearance; containing many large bullets of various ſizes and ſhapes, without any marks of regular ſtratification, but looking like one vaſt maſs of bullets of unequal thickneſs; and in this manner frequently ſwelled to the ſize of a conſiderable mountain. It is frequently cemented very ſtrongly together; ſo that parts of the hills compoſed of it will frequently overhang in dreadful precipices, leſs apt to break off than other rocks in the ſame ſituation; one reaſon for which, beſides the ſtrength of the cement, is, that the breccia, when compoſed of bullets, is leſs ſubject to fiſſures and cutters than other rocks; being frequently found in one ſolid maſs of great extent and thickneſs. Some of the plumpudding-rocks are made up of ſmaller parts, coming near to the ſize of coarſe gravel. It is evident however, that all the parts of the breccia, whether coarſe or fine, have been rounded by agitation in water, as the rocks differ nothing in appearance from the coarſer and finer gravel found upon the beach of the ſea, excepting only that the parts are ſtrongly cemented together in the rocks, and are looſe upon the ſhores of the ocean.

Some of the breccia is compoſed of finely rounded ſtones of various and beautiful colours, about the ſize of plums or nuts, all very hard and fine. Were this ſpecies ſawed and poliſhed, it would appear as beautiful and elegant as any ſtone in Europe; much reſembling moſaic work in ſmall patterns.

In general, the breccia is regularly ſtratified or not according to the ſize of the component parts of the ſtone. Such rocks as are compoſed of round gravel and ſmall bullets are generally very regular in their ſtatification, while thoſe which contain bullets ſomewhat larger in ſize are commonly diſpoſed in thick and coarſe beds, and ſuch rocks as are made up of the largeſt kind of bullets ſeldom ſhow any marks of ſtratification at all.

Among many other places in Scotland, where breccia or pudding-ſtone abounds, there are extenſive rocks and high cliffs of it upon the ſouth ſhore at the weſt end of the Pentland Frith, to the weſtward of Thurſo in Caithneſs, which ſtretch quite acroſs the county of Caithneſs into Sutherland; and in Sutherland as well as Caithneſs, this rock is of a rough contexture, and appears in pretty high hills, deep glens, overhanging rocks, and frightful precipices, to the weſt of Brora, Dunrobin, and Dornoch, which gives it a groteſque and formidable appearance in that country. This range of breccia ſtretches alſo quite through Sutherland, and likewiſe through Roſsſhire, the weſt ſide of Ferndonald, and Dingwall, where it exhibits the very ſame phenomena as in Sutherland and in Caithneſs. It continues the ſame longitudinal line of bearing, which is nearly from north-eaſt to ſouth-weſt, quite through the highland countries of Inverneſs and Perthſhire; and it forms conſiderable hills, and very high and rugged rocks, upon both ſides of that beautiful piece of freſh water Lochneſs. Much of the ſtone here as well as in other places in this range, is compoſed of large bullets; the rock is very hard and ſtrong, and it hangs in frighthful precipices upon both ſides of the lake, through which rock Ge-far, ſince their particles are ſo big and plain as to be eaſily known from one another. Theſe ſtones are a proof both of the ſubverſions which the mountains in many centuries have undergone, and of ſome hidden means which nature makes uſe of in thus cementing different kinds of ſtones together. Any certain bigneſs for the kernels or lumps in ſuch compounds, before they deſerve the name of *breccia*, cannot be determined, becauſe that depends on a compariſon which every one is at liberty to imagine. In ſome places, the kernels of porphyry have a diameter of ſix feet, while in others they are no bigger than walnuts. Sometimes they have a progreſſive ſize down to that of a find ſandſtone. Moſt of this kind of ſtone is fit for ornaments, though the workmanſhip is very difficult and coſtly.

B. Conglutinated ſtones of granules or ſands of different kinds. Sandſtone; *Lapis arenaceus*.

In this diviſion are reckoned thoſe which conſiſt of ſuch minute particles, that all of them cannot eaſily be diſcovered by the naked eye. The greateſt part, however, conſiſt of quartz and mica; which ſubſtances are the moſt fit to be granulated, without being brought to a powder.

1. Cemented by clay.
   - *a.* With an apyrous or refractory clay. This is of a looſe texture; but hardens, and is very refractory in the fire.
   - *b.* With common clay.
2. With lime; reſembles mortar made with coarſe ſand.
   - *a.* Conſiſting of tranſparent and greeniſh grains of quartz and white limeſtone.
   - *b.* Of no viſible particles. This is of a looſe texture, and hardens in the air.
3. With an unknown cement.
   - *a.* Looſe.
   - *b.* Harder.
   - *c.* Compact.
   - *d.* Very hard.
4. Cemented by the ruſt or ochre of iron. Is found in form of looſe ſtones at ſeveral places, and ought perhaps to be reckoned among the *mineræ arenaceæ* or ſand ores; at leaſt when the martial ochre makes any conſiderable portion of the whole.
5. Grit-ſtone. This is of greater or leſs hardneſs, moſtly of a grey, and ſometimes of a yellowiſh colour; compoſed of a ſiliceous and micaceous ſand, and rarely of a ſparry kind, with greater or leſſer particles cloſely compacted and united by an argillaceous cement. It gives ſome ſparks with ſteel, is indiſſoluble for the moſt part in acids, and vitrifiable in a ſtrong fire. It is uſed for millſtones and whetſtones, ſometimes for filtering ſtones and for building. *Fabroni.*

   N. B. The *argillaceous* girt has been before deſcribed, p. 89. col. 1.
6. Elaſtic. A ſingular ſpecies of ſandſtone, of which a ſpecimen was ſhown ſome years ago to the Royal Academy of Sciences at Paris by the Baron de Dietrich. It is flexible and elaſtic; and conſiſts of ſmall grains of hard quartz, that ſtrike fire with tempered ſteel, together with ſome micaceous mixture. The elaſticity ſeems to depend on the micaceous part, and ſoftneſs of the natural gluten between both. It is ſaid, that this elaſtic ſtone was found in Brazil, and brought to Germany by his excellency the Marquis de Lavradio.

   There are alſo two tables of white marble, kept in the palace Borgheſe at Rome, which have the ſame property, But the ſparry particles of their ſubſtance, though tranſparent, are rather ſoft; may be eaſily ſeparated with the nail, and effervefce with aqua-fortis; and there is alſo in it a little mixture of ſmall particles of talc or mica. Se *Journ. de Phyſ.* for Oct. 1784, p. 275. See alſo the article MARBLE (*Elaſtic.*)

C. Stones and ores cemented together; *Mineræ arenaceæ*.

1. Of larger fragments.
   - *a.* Mountain green, or *viride montanum cupri*, and pebbles cemented together, from Siberia.
   - *b.* Potters lead-ore, with limeſtone, ſlate-kernels, and ſhells.
   - *c.* Yellow or marcaſitical copper ore, with ſmall pebbles.
2. Of ſmaller pieces.
   - *a.* Potter's lead-ore with a quartzoſe ſand.
   - *b.* Mountain green with ſand from Siberia.
   - *c.* Cobalt ore with ſand.
   - *d.* Martial ochre with ſand.

Order II. MINERAL CHANGES, or PETRIFACTIONS.

THESE are mineral bodies in the form of animals or vegetables, and for this reaſon no others belong to this order than ſuch as have been really changed from the ſubjects of the other two kingdoms of nature.

I. Earthy changes; *Terræ larvatæ*.

A. Extraneous bodies changed into a lime ſubſtance, or calcareous changes; *Larvæ calcareæ*.

(1.) Looſe or friable. Chalky changes; *Cretæ larvatæ*.

a. In

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neral Wade cut a fine military road upon the ſouth ſide of the lake, at a great expence of time, labour, and gunpowder. Theſe rocks are ſeen ſtretching through the mountains of Stratherig into Badenoch, where it forms a remarkable rock and precipice called *Craigdow* or the *Black Rock*. The ſame range is again ſeen farther towards the ſouth-weſt, in ſeveral places to the ſouth of the Black Mount, and in the country of Glenorchy in Argyleſhire: and Mr Williams ſuppoſes, that the longitudinal line of this rock, ſo far as it has been juſt pointed out, is little leſs than 200 miles, and in ſome places it ſpreads eight or ten miles in what may be called the latitudinal line acroſs the bearing of the rocks.

Appendix. Petrifactions.

a. In form of vegetables.

b. In form of animals.

1. Calcined or mouldered ſhells; *Humus conchaceus.*

(2.) Indurated; *Petrifacta calcarea.*

a. Changed and filled with ſolid limeſtone.

1. In form of animals.

2. In form of vegetables.

b. Changed into a calcareous ſpar; *Petrifacta calcarea ſpatoſa.*

1. In form of animals.

2. In form of vegetables.

B. Extraneous bodies changed into a flinty ſubſtance. Siliceous changes; *Larvæ ſiliceæ.* Theſe are, like the flint,

(1) Indurated.

a. Changed into flints.

1. Carnelians in form of ſhells, from the river Tomm in Siberia.

2. Agat in form of wood. Such a piece is ſaid to be in the collection of Count Teſſin.

3. Coralloids of white flint, (*Millepora.*)

4. Wood of yellow flint.

C. Extraneous bodies changed into clay. Argillaceous changes; *Larvæ argillaceæ.*

A. Looſe and friable.

1. Of porcelain clay.

a. In form of vegetables.

A piece of white porcelain clay from Japan, with all the marks of the root of a tree, has been obſerved in a certain collection.

B. Indurated,

1. In an unknown clay.

a. In form of vegetables. *Oſteocolla.* It is ſaid to be changed roots of the poplar tree, and not to conſiſt of any calcareous ſubſtance.

A ſort of foſſile ivory is ſaid to be found, which has the properties of a clay; but it is doubtful if it has been rightly examined.

II. Saline extraneous bodies, or ſuch as are penetrated by mineral ſalts. *Corpora peregrina inſalita. Larvæ inſalitæ.*

A. With the vitriol of iron.

1. Animals.

a. Human bodies have been twice found in the mine at Falun in Dalarne; the laſt was kept a good many years in a glaſs-caſe, but began at laſt to moulder and fall to pieces.

2. Vegetables.

a. Turf, and

b. Roots of trees.

Theſe are found in water ſtrongly impregnated with vitriol. They do not burn with a flame, but only like coal in a ſtrong fire; neither do they decay in the air.

III. Extraneous bodies penetrated by mineral inflammable ſubſtances, or mineral phlogſtion.

A. Penetrated by the ſubſtance of pit-coals.

1. Vegetables, which commonly have been woods, or appertaining to them.

a. Fully ſaturated. *Gagas,* Jet. (See p. 104. col. 2.) The jet is of a ſolid ſhining texture.

b. Not perfectly ſaturated; *Mumia vegetabilis.* It is looſe; reſembles umber, and may uſed as ſuch.

B. Penetrated by rock-oil or aſphaltum.

1. Vegetables.

a. Turf.

The Egyptian mummies cannot have any place here, ſince art alone is the occaſion that thoſe human bodies have in length of time been penetrated by the aſphaltum, in the ſame manner as has happened naturally to the wood in pit coal ſtrata. See MUMMY.

C. Penetrated by ſulphur which has diſſolved iron, or by marcaſite and pyrites. *Pyrite impregnata. Petrifacta pyritacea.*

1. Animals.

a. Human.

b. Bivalves.

c. Univalves.

d. Inſects.

IV. Metals in form of extraneous bodies; *Larvæ metalliferæ.*

A. Silver; *Larvæ argentiferæ.*

(1.) Native.

a. On the ſurfaces of ſhells.

(2.) Mineraliſed with copper and ſulphur.

a. Fahlertz, or grey ſilver ore in form of ears of corn, &c. and ſuppoſed to be vegetables, are found in argillaceous ſlate at Frankenberg and Tahlitteren in Heſſe.

B. Copper; *Larvæ cupriferæ.*

(1.) Copper in form of calx.

a. In form of animals, or of parts belonging to them.

1. Ivory and other bones of the elephant. The Turcois or Turquoiſe; which is of a bluiſh green colour, and much valued in the eaſt.

At Simore in Languedoc bones of animals are dug, which during the calcination aſſume a blue colour; but it is not probable that the blue colour is owing to copper.

(2.) Mineraliſed copper, which impregnates extraneous bodies; *Cuprum mineraliſatum corpora peregrina ingreſſum.*

A. With ſulphur and iron. The yellow or marcaſitical copper ore that impregnates.

1. Animals.

a. Shells.

b. In form of fiſh.

B. With ſulphur and ſilver. Grey ſilver ore or fahlerts, like ears of corn, from the ſlate-quaries in Heſſe.

C. Changes into iron; *Larvæ ferriferæ.*

(1.) Iron in form of calx, which has aſſumed the place or the ſhape of extraneous bodies; *Ferrum calciforme corpora peregrina ingreſſum.*

a. Looſe; *Larvæ ochraceæ.*

1. Of vegetables.

Roots of trees, from the lake Langelma in Finland. See the acts of the Swediſh Academy of Sciences for the year 1742.

b. Indurated; *Larvæ hæmatiticæ.*

1. Of vegetables.

(2.) Iron mineraliſed, aſſuming the ſhape of extraneous bodies.

a. Mineraliſed with ſulphur. Marcaſite. *Larvæ pyritaceæ.*

V. Extraneous bodies decompoſing, or in a way of deſtruction; *Corpora peregrina in gradibus deſtructionis conſiderata.* Mould; *Humus.* Turf; *Turba.*

A. From animals. Animal-mould; *Humus animalis.*

1. Shells. *Humus conchaceus.*

2. Mould of other animals; *Humus diverſorum animalium.*

B. Vegetable mould; *Humus vegetabilis.*

1. Turf; *Turba.*

a. Solid, and hardening in the air; *Turba ſolida aere indureſcens.* This is the beſt of the kind to be uſed for fuel, and comes neareſt to the pit-coals. It often contains a little of the vitriolic acid.

b. Lamelated turf; *Turba foliata.* This is in the firſt degree of deſtruction.

2. Mould of lakes; *Humus lacuſtris.* This is a black mould which is edulcorated by water.

3. Black mould; *Humus ater.* This is univerſally known, and covers the ſurface of that looſe earth in which vegetables thrive beſt.

Order III. Volcanic Products (H)

I. Slags; *Scoriæ vulcanorum.*

Slags are found in great abundance in many places of the world, not only where volcanoes yet exiſt, but likewiſe where no ſubterraneous fire is now known: Yet, in Mr Cronſtedt's opinion, they cannot be produced but by means of fire. Theſe are not properly to be called *natural,* ſince they have marks of violence, and of the laſt change that mineral bodies can ſuffer without the deſtruction of the world: nor are they *artificial,* according to the univerſally received meaning of this word. We cannot, however, avoid giving them a place here, eſpecially after having admitted the petrifactions; and ſhall therefore arrange the principal of them, according to their external marks.

A. Iceland agate; *Achates iſlandicus niger.*

It is black, ſolid, and of a glaſſy texture; but in thin pieces it is greeniſh and ſemitranſparent like glaſs-bottles, which contain much iron. The moſt remarkable circumſtance is, that ſuch large ſolid maſſes are found of it, that there is no poſſibility of producing the like in any glaſs-houſe.

It is found in Iceland, and in the iſland of Aſcenſion: The jewellers employ it as an agate, though it is too ſoft to reſiſt wear.

B. Rheniſh millſtone; *Lapis molaris Rhenanus.*

Is blackiſh-grey, porous, and perfectly reſembles a ſort of ſlag produced by mount Veſuvius. A variety of lava, according to Kirwan.

C. Pumice-ſtone; *Pumex.*

It is very porous and bliſtered, in conſequence of which it is ſpecifically very light. It reſembles that frothy ſlag which is produced in the iron furnaces.

1. White.

2. Black.

The colour of the firſt is perhaps faded or bleached, becauſe the ſecond kind comes in that ſtate from the laboratory itſelf, *viz.* the volcanoes.

D. Pearl ſlag; *Scoriæ conſtantes globulis vitreis conglomeratis.*

It is compounded of white and greeniſh glaſs particles, which ſeem to have been conglutinated while yet ſoft or in fuſion. Found on the Iſle of Aſcenſion.

E. Slag-ſand or aſhes; *Scoriæ pulverulentæ, cineres vulcanorum.*

This is thrown out from volcanoes in form of larger or ſmaller grains. It may perhaps be the principle of the Terra Puzzolana; becauſe ſuch an earth is ſaid at this time to cover the ruins of Herculaneum near Naples, which hiſtory informs us was deſtroyed by a volcano during an earthquake

II. Lavas.

Lava has been generally underſtood to denote the aggregate maſs of melted matters which flow out of the mouths, or burſt out from the ſides, of burning mountains. According to Mr Kirwan, however, lavas are the immediate produce of liquefaction or vitrification by the volcanic fires, and "ſhould carefully be diſtinguiſhed from the ſubſequent productions affected by the water either in a liquid or fluid ſtate, which generally is ejected at the ſame time." And of lavas, ſo diſtinguiſhed, he deſcribes ſeveral varieties. See the article Lava, in the order of the alphabet; where the nature, origin, kinds, and phenomena of lavas, are copiouſly deſcribed and explained.

III. Baſaltes.

This ſort of ſtone was by Cronſtedt, in the firſt edition of his Mineralogy, ranked among the garnet earths, and confounded with the ſhoerls; an impropriety which was pointed out by Bergman in his *Sciagraphia,* ſect. 120.—Mr Kirwan conſiders baſaltes as an imperfect lava, and aſcribes its origin both to fire and water. He deſcribes it as found, either, 1. In opaque triangular or polyangular columns; which is the proper baſaltes: Or, 2. In amorphous maſſes of different magnitudes; forming ſolid blocks, from the ſmalleſt ſize to that of whole mountains: which kind is called *trapp.* See the detached article Basaltes (I); where its ſpecies and varieties

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(H) For the nature, hiſtory, theory, &c. of volcanoes, ſee the article Volcano.

(I) In that article, p. 46. col. 1. l. 9. *dele* the words, "The Engliſh miners call it *cockle,* the German *ſhoerl.*" —P 47 col. 2. l. 28. for "a kind of marble," read "a volcanic production." The *Lapis Lydius,* or Touchſtone, mentioned in the ſame paragraph, ſhould have been ſpecified to be of the ſort called *Trapp.*

rieties are particularly deſcribed, and different opinions ſtated concerning its formation. See alſo the article Trapp.—Some plauſible arguments againſt the volcanic origin of baſaltes will be mentioned in the courſe of the ſubjoined note (κ), extracted from *Williams's Natural Hiſtory of the Mineral Kingdom.*

(κ) There is a great variety of baſaltes in Scotland, particularly of the grey kinds; ſome of which are capable of the higheſt degree of poliſh. A good black kind is met with on the ſouth ſide of Arthur's Seat near Edinburgh, where it forms a ſmooth perpendicular rock, with ſeveral of the columns broken off, and the ſuſpended pieces threatening to fall down upon the paſſengers below. This ſtone is capable of receiving a fine poliſh; and, in the opinion of Mr Williams, would be fit for all ſorts of ornaments about ſepulchral monuments. It will poliſh to a bright and beautiful black which will be unfading.

There is another kind, heavy and hard, of a black, or blackiſh grey colour; of which great quantities have been carried from the Frith of Forth to pave the ſtreets of London. This, for the moſt part, is coarſely granulated in the inſide, though ſometimes the grain is pretty fine. Sometimes it is bright in the inſide when broken. It is compoſed of grains of quartz and ſhirl of different ſizes, and commonly contains ſome iron. It always appears in thick, irregular, beds, ſome of which are enormouſly thick; and ſeldom or never equally ſo: on the contrary, where it is found uppermoſt, it frequently ſwells into little hills of various ſizes. Moſt of the ſmall iſlands in the Frith of Forth are compoſed of this kind of ſtone; as well as ſome hills in the neighbourhood of Inverkeithing and of Edinburgh.

The known characteriſtic of the baſaltes is to form itſelf into balls, columns, and other regular figures. The columnar kind aſſumes a pentagonal, hexagonal or heptagonal figure; but quadrangular columns are not common. They are all ſmooth on the outſide, and lie parallel and contiguous to one another; ſometimes perpendicular, ſometimes inclining, in proportion to the poſition of the ſtratum which is thus divided: If the ſtratum lies horizontal, the columns are perpendicular; if inclining, the pillars alſo incline in exact proportion to the declivity of the ſtrata, being always broken right acroſs the ſtratum. Some are of one piece from top to bottom; others divided by one or more joints laid upon one another, which form a column of ſeveral parts. The rock called the *Giant's Cauſeway* in Ireland is a pretty good ſpecimen of the jointed columnar baſaltes: but there is a more beautiful ſpecies above Hillhouſe lime-quarry, about a mile ſouth of Linlithgow in Scotland; and a coarſer one near the toll-bar north ſide of Queen's Ferry, and ſeveral other places in Fife. In ſome places the baſaltes are formed into magnificent columns of great length; and in others afford an aſſemblage of ſmall and beautiful pillars reſembling a range of balluſtrades or organ pipes. Some of the columns on the ſouth ſide of Arthur's Seat already mentioned are very long; and there are likewiſe magnificent columns of great length in the iſland of Egg, and others of the Hebrides. Theſe columns, when broken, are frequently of a black, or blackiſh grey, in the inſide; ſome of them being compoſed of ſmall grains, which gives them an uniform and ſmooth texture; but much of this ſpecies of ſtone has larger grains in its compoſition, rough, ſharp, and unequal, when broken. All the grains, however, are fine, hard, and bright; and the ſtone in general is capable of a fine poliſh.

The other ſpecies of baſaltes which forms itſelf into diſtinct maſſes, aſſumes ſometimes a quadrangular, ſometimes an oval, globular, or indeterminate figure. They are found of all ſizes from the ſize of an egg to that of an houſe: but though they differ in ſhape from the columnar baſaltes, they agree in almoſt every other reſpect; whence Mr Williams thinks that they are only to be accounted a variety of the columnar kind. It is common to ſee one ſtratum of the baſaltine rocks exhibiting, in one place, regular pillars or globes; and near theſe, very irregular ones, differing very little from the common cutters found in all rocks; and at no great diſtance, the ſame rock is found to run into one entire maſs, exhibiting no tendency to be broken or divided into any columns whatever, Of this the rock of Arthur's Seat is an inſtance. Some of theſe only produce ſolid maſſes of different figures and ſizes; while others produce quantities of a ſofter, friable, ſtony matter, of the ſame quality in which the hard maſſes of different figures are found imbedded. Pretty good ſpecimens of the ſecond kind or variety of baſaltes are met with on the road-ſide between Cramond bridge and the Queen's Ferry, and in ſeveral other places in the Lothians and in Fife.

The cruſtated baſaltes are of two kinds; 1. Such as have the cruſts more dry and friable than the internal parts; and, 2. Such as are dry and friable throughout the whole maſs.

The firſt of theſe has not only a cruſt of the friable matter adhering to it, but is likewiſe imbedded in a quantity of the ſame. Our author has ſeen many quarries of this kind of baſaltes dug for the high roads, in which the quantity of ſoft friable matter greatly exceeded that of the hard maſſes, and in which incruſted ſtones of various ſizes and ſhapes appeared. In ſuch quarries, ſome of the largeſt maſſes have only a few coats of penetrable friable matter, ſurrounding a nucleus which varies in ſize, but is uniformly hard throughout; and we ſhall find other yolks in the ſame quarry imbedded in the ſofter matter, which, when broken, exhibit a neſt of ſtones including one another like the ſeveral coats of an onion. Theſe cruſtated baſaltes which envelope one another are a curious ſpecies of ſtone. The ſeveral coats of ſurrounding matter differ nothing in quality from the ſtones contained in them, and ſome of the inner cruſts are often very hard; but the nucleus within, though ſmall, is always the hardeſt. The decompoſition by the weathering of the ſofter matter found ſurrounding and enveloping the harder maſſes of ſtone in this and the ſecond ſpe-

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cies of baſaltine rocks, has produced a phenomenon frequently met with in Great Britain, eſpecially in Scotland, which greatly puzzles many. It is very common in low grounds, and upon ſome moderate eminence, to ſee a prodigious multitude of ſtones of all ſhapes and ſizes, very hard, and pretty ſmooth on the outſide. Theſe ſtones are ſometimes ſo numerous and large, that it is often found impracticable to clear a field of them. Where thoſe ſtones are a ſpecies of baſaltes, which they commonly are, and of the ſecond ſpecies of baſaltes deſcribed above, they always originate from a decompoſition of the more ſoft or friable parts of theſe rocks, which moulder or fall away, and leave the harder ſtones detached and ſcattered about, and the decompoſed matter diſſolves by degrees, and becomes good corn mould.

Here Mr Williams takes occaſion to conteſt the opinion of thoſe who think that ſtones grow or vegetate like plants. He owns indeed that they increaſe in bulk: but this, he ſays, is only in ſuch ſituations as are favourable for an accretion of matter carried down and depoſited by the water; in all other ſituations they grow leſs and leſs. "Others (ſays he) imagine, that theſe ſtones (on which this extraneous matter has been depoſited) were rolled about; that the aſperites and ſharp angles were by that means worn off; and that they were all at laſt depoſited as we ſee them, by the waters of the univerſal deluge: and, having their obtuſe ſides and angles, as if they had been rounded by rolling in water, makes theſe gentlemen confident that they are right; and if we did not frequently find ſtones exactly of the ſame figure, ſize, and quality in the rock, it would be very difficult to overthrow this hypotheſis. I have taken great pains to inveſtigate this point, having frequently examined circumſtances; and never failed to diſcover the ſtratum of rock which theſe detached ſtones originally belonged to. "The ſtrata or beds of the ſeveral ſpecies of baſaltes ſpread as wide, and ſtretch as far, as the other concomitant ſtrata in the neighbourhood where they are found: but they often lie very flat, or with a moderate degree of declivity; and conſequently, when the ſofter and more friable matter found in the interſtices of theſe rocks, which incloſes and binds the harder maſſes in their native beds, is decompoſed, the harder ſtones muſt then lie ſcattered wide upon the face of the ground."

The ſecond ſpecies of the cruſtated baſaltes, viz. that which is dry and friable throughout the whole maſs, is generally of a coarſe and granulated texture, and of all the various ſhades of grey colours; from a ruſty black to a light-coloured grey. This kind of cruſtated baſaltes is developed when the maſſes are either broken or in a ſtate of decompoſition; and there are maſſes of it of all ſizes and ſhapes found in the rocks, reſembling the ſecond and third ſpecies of the baſaltes; appearing alike ſmooth on the outſide, with obtuſe angles; in ſhort, reſembling the baſaltes in every reſpect: but when they are expoſed to the external air and weather for any conſiderable time, the ſeveral incruſtations decay, decompoſe, and crumble down by degrees. When they quarry this ſpecies of baſaltes for the roads, they are able to break and pound them ſmall with eaſe; but the harder ſpecies are ſo hard and coheſive, that they are with the greateſt difficulty broken into ſufficiently ſmall parts.

Compoſite baſaltes reſembles the three laſt ſpecies, in figure, colour, and all other external appearances; being diſtinguiſhable from them only in the internal ſtructure or grain of the ſtone. It reſembles ſome of the granites, as conſiſting of much larger grains than the other baſaltes. Many of the larger grains in the compoſite baſaltes are more than an eighth part of an inch over, and ſome more than a fourth; appearing with ſmooth flat ſurfaces, and of a tabulated texture, exactly reſembling the quartzy grains ſo commonly found in the compoſition of moſt of the granites. The chief, if not the only, diſtinguiſhable difference between the grains in each of them is the colour. They are evidently large grains of quartz, &c. which exhibit flat ſhining ſurfaces in both. Thoſe grains or fragments are commonly white, yellowiſh, red, or black, in the compoſition of moſt of the granites; whereas they are often ſeen of a pale blue, or a bluiſh grey colour, in the compoſite baſaltes, and ſome of them approaching to white. It is only in the *internal* ſtructure, however, that theſe baſaltes have any reſemblances to the granites; in all the external characters, they differ nothing from the reſt of their own genus.

A fifth ſpecies of baſaltes is indurated through the whole ſtratum, ſolid and uniform through all its parts, and exhibiting only ſuch cracks and fiſſures or cutters as are commonly met with in other hard beds of ſtones. Many beds of this ſpecies are frequently met with in the coal-fields, and the miners are often obliged to ſink through them in their coal-pits. "The Saliſbury craigs at Edinburgh (ſays our author) might be ſingled out as a good example of this ſpecies of ſtone, were it not that part of the ſame ſtratum is formed into columns on Arthur's ſeat; though, I believe, this is no good exception, as it evidently appears that the beds of baſaltes which are formed into columns, globes, &c. only aſſume theſe figures where they are expoſed to the influence of the external air, or have but little cover of rock above them. When any of thoſe beds ſtrike deep under the cover of ſeveral other ſtrata, they are not found in columns, &c. Nothing but an uniform maſs then appears, although the ſame bed is regularly formed near the ſurface; which proves that the columnar and other baſaltes are formed by ſhrinking and chapping.

"The ſtrata of baſaltes ſpread as wide, and ſtretch as far in the longitudinal bearing, as the other different ſtrata which accompany them in the countries where they are found. The rocks of baſaltes alſo are generally found in very thick ſtrata; and that generally in places where no other rock is found above the baſaltes, the ſtrata of it are often very unequal in thickneſs. But this, in general, is only in ſituations where no other rock is found above it; for when it fairly enters into the ſurface of the earth, ſo as to have other regular ſtrata above it, which is ſeen in an hundred places in the Lothians, Fife, and other parts of Scotland, it then appears pretty equal in thickneſs, as equal as moſt other beds of ſuch great thickneſs are; and yet it is remarkable, that although moſt of the ſtrata of baſaltes are of great thickneſs, there are frequently thin

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ſtrata of various kinds found both above and below it. We have numerous examples of this in all the parts of Scotland where baſaltes is found; as for inſtance, there are thin and regular ſtrata ſeen and quarried both above and below the thick bed of that rock in the Saliſbury craigs near Edinburgh. In the Bathgate hills, ſouth of Linlithgow, and many other parts of Scotland, there are ſeveral ſtrata of baſaltes, and likewiſe of coal, limeſtone, freeſtone, and other concomitants of coal blended promiſcuouſly *ſtratum ſuper ſtratum*; and the baſalt is frequently found immediately above, and immediately below regular ſtrata of coal; of courſe baſaltes *is not the lava of volcanoes*. We can prove to ocular demonſtration, from the component parts, and from the ſituation, ſtretch, and bearing of the ſtrata of baſaltes, that they are real beds of ſtone, coeval with all the other ſtrata which accompany them; and are blended with them in the ſtructure of that part of the globe where they are found, as they dip and ſtretch as far every way as the other ſtrata found above and below them. If baſaltes, therefore, be a volcanic production, the other ſtrata muſt of neceſſity be ſo likewiſe. But how volcanoes ſhould produce coal, and how that coal ſhould come into contact with burning lava, is not a little problematical: or rather it is ſtrangely abſurd to imagine that burning lava can come into contact with coal without deſtroying it.

The regularly ſtratified quartzy white-mountain rock is ſcarce or rather not to be found in moſt parts of Britain. In the Highlands, however, it is very common; and in ſome places of them Mr Williams has ſeen it ſtratified as regularly as any of the ſand-ſtones, with other regular ſtrata of different qualities immediately above and below it; and ſometimes compoſing large and high mountains entirely of its own ſtrata. This ſtone is exceedingly hard, dry, and brittle, full of cracks and ſharp angles; the different ſtrata ſometimes moderately ſolid, but often naturally broken into ſmall irregular maſſes, with angles as ſharp as broken glaſs, and of an uniformly fine and granulated texture, reſembling the fineſt ſugar-loaf. There are large and high mountains of this ſtone in Roſsſhire and Invernеſsſhire, which, in a clear day, appear at a diſtance as white as ſnow, without any ſort of vegetation on them except a little dry heath round the edge of the hill.

Minerva.

MINERVA, or Pallas, in Pagan worſhip, the goddeſs of ſciences and of wiſdom, ſprung completely armed from Jupiter's brain; and on the day of her nativity it rained gold at Rhodes. She diſputed with Neptune the honour of giving a name to the city of Athens; when they agreed that whoſoever of them ſhould produce what was moſt uſeful to mankind, ſhould have that advantage. Neptune, with a ſtroke of his trident, formed a horſe; and Minerva cauſed an olive to ſpring from the ground, which was judged to be moſt uſeful, from its being the ſymbol of peace. Minerva changed Arachne into a ſpider, for pretending to excel her in making tapeſtry. She fought the giants; favoured Cadmus, Ulyſſes, and other heroes; and refuſed to marry Vulcan, chooſing rather to live in a ſtate of celibacy. She alſo deprived Tireſias of ſight, turned Meduſa's locks into ſnakes, and performed ſeveral other exploits.

Minerva is uſually repreſented by the poets, painters, and ſculptors, completely armed, with a compoſed but agreeable countenance, bearing a golden breaſtplate, a ſpear in her right-hand, and her ægis or ſhield in the left, on which is repreſented Meduſa's head encircled with ſnakes, and her helmet was uſually entwined with olives.

Minerva had ſeveral temples both in Greece and Italy. The uſual victim offered her was a white heifer, never yoked. The animals ſacred to her were the cock, the owl, and the baſiliſk.

Minervæ Caſtrum, *Arx Minervæ*, *Minervium*, or *Templum Minervæ*, (anc. geogr.), a citadel, temple, and town on the Ionian ſea, beyond Hydrus; ſeen a great way out at ſea. Now *Caſtro*, a town of Otranto in Naples. E. Long. 19. 25. N. Lat. 46. 8.

Minervæ Promontorium (anc. geogr.), the ſeat of the Sirens, a promontory in the Sinus Paeſtanus, the ſouth boundary of Campania on the Tuſcan coaſt; ſo called from a temple of Minerva on it: ſituated to the ſouth of Surrentum, and therefore called *Surrentinum*. Now *Capo della Minerva*, on the weſt coaſt of Naples, over-againſt the iſland Capri.

Minervalia
Mingrelia.

MINERVALIA, in Roman antiquity, feſtivals celebrated in honour of Minerva, in the month of March; at which time the ſcholars had a vacation, and uſually made a preſent to their maſters, called from this feſtival *Minerval*.

MINGRELIA, anciently Colchis, a part of Weſtern Georgia, in Aſia; bounded on the eaſt by Iberia, or *Georgia* properly ſo called; on the weſt, by the Euxine Sea; on the ſouth, by Armenia, and part of Pontus; and on the north, by Mount Caucaſus.

Colchis, or Mingrelia, is watered by a great many rivers; as the Corax, the Hippus, the Cyaneus, the Chariſtus, the Phaſis, where the Argonauts landed, the Abſarus, the Ciſſa, and the Ophis, all emptying themſelves into the Euxine Sea. The Phaſis does not ſpring from the Mountains in Armenia, near the ſources of the Euphrates, the Araxes, and the Tigris, as Strabo, Pliny, Ptolemy, Dionyſius, and after them Arrian, Reland, Calmet, and Sanſon, have falſely aſſerted; but riſes in Mount Caucaſus; and flows not from ſouth to north, but from north to ſouth, as appears from the map of Colchis or Mingrelia in Thevenot's collection, and the account which Sir John Chardin gives of that country. This river forms in its courſe a ſmall iſland called alſo *Phaſis*; whence the pheaſants, if Iſidorus is to be credited, were firſt brought to Europe, and thence called by the Greeks *Phaſiani*. The other rivers of Colchis are conſiderable.

The whole kingdom of Colchis was in ancient times very pleaſant and fruitful, as it is ſtill where duly cultivated; abounded in all the neceſſaries of life; and was enriched with many mines of gold, which gave occaſion to the fable of the Golden Fleece and the Argonautic expedition ſo much celebrated by the ancients.

Mingrelia.

Sir John Chardin tells us, that this country extends above 100 miles in length and 60 in breadth; being not near ſo extenſive as the ancient Colchis, which reached from the frontiers of Iberia or Georgia Proper, weſtward to the Palus Mæotis: that it is béautifully diverſified with hills, mountains, valleys, woods, and plains, but badly cultivated: that there are all the kinds of fruits which are found in England, growing wild, but taſteleſs and inſipid for want of culture: that, if the natives underſtood the art of making wines, thoſe of this country would be the fineſt in the world: that there are many rivers which have their ſource in mount Caucaſus, particularly the Phaſis, now called the *Rione:* that the country abounds in beeves, hogs, wild boars, ſtags, and other veniſon; and in partridges, pheaſants, and quails; that falcons, eagles, pelicans, lions, leopards, tigers, wolves, and jackals, breed on Mount Caucaſus, and ſometimes greatly annoy the country: that the people are generally handſome, the men ſtrong and well made, and the women very beautiful; but both ſexes very vicious and debauched: that they marry their nieces, aunts, or other relations, indifferently; and take two or three wives if they pleaſe, and as many concubines as they will: that they not only make a common practice of ſelling their children, but even murder them, or bury them alive, when they find it difficult to bring them up: that the common people uſe a ſort of paſte, made of a plant called *gom*, inſtead of bread; but that of the better ſort conſiſts of wheat, barley, or rice: that the gentry have an abſolute power over their vaſſals, which extends to life, liberty, and eſtate: that their arms are the bow and arrow, the lance, the ſabre or broad-ſword, and the buckler: that they are very naſty; and eat ſitting croſs-legged upon a carpet, like the Perſians; but the poorer ſort upon a mat or bench, in the ſame poſture: that the country is very thin of inhabitants, no leſs than 12,000 being ſuppoſed to be ſold yearly to the Turks and Perſians: that the principal commodities exported from it are, honey, wax, hides, caſtor, martin-ſkins, flax-ſeed, thread, ſilk, and linen-cloth; but that there are no gold or ſilver mines now, and very little money: that the revenue of the prince or viceroy amounts to about 20,000 crowns *per annum:* that the inhabitants call themſelves *Chriſtians;* but that both they and their prieſts are altogether illiterate, and ignorant of the doctrines and precepts of Chriſtianity: that their biſhops are rich, have a great number of vaſſals, and are clothed in ſcarlet and velvet: and that their ſervice is according to the rites of the Greek church, with a mixture of Judaiſm and Paganiſm.

The cities of moſt note in this country in ancient times were Pityus; Dioſcurias, or Dioſcorias, which was ſo called from Caſtor and Pollux, two of the Argonauts, by whom it is ſuppoſed to have been founded, and who in Greek are ſtyled *Dioſcuroi,* at preſent known by the name of *Savatapoli;* Aea on the Phaſis, ſuppoſed to be the ſame as Hupolis; *Phaſis,* ſo called from the river on which it ſtood; Cyta, at the mouth of the river Cyaneus, the birth place of the famous Medea, called from thence, by the poets, *Cytæis;* Saracæ, Zadris Surium, Madia, and Zoliſſa. As for modern cities, it does not appear that there are any here conſiderable enough to merit a deſcription; or, if there are, they ſeem to be little, if at all, known to Europeans.

Minho, Miniature.

MINHO, a great river in Spain, which taking its riſe in Galicia, divides that province from Portugal, and falls into the Atlantic at Caminha.

MINIATURE, in a general ſenſe, ſignifies repreſentation in a ſmall compaſs, or leſs than the reality.

MINIATURE-PAINTING;

A DELICATE kind of painting, conſiſting of little points or dots; uſually done on vellum, ivory, or paper, with very thin, ſimple water-colours.—The word comes from the Latin *minium,* "redlead;" that being a colour much uſed in this kind of painting. The French frequently call it *mignature,* from *mignon,* "fine, pretty," on account of its ſmallneſs and delicacy: and it may be ultimately derived from μικρος "ſmall."

Miniature is diſtinguiſhed from other kinds of painting by the ſmallneſs and delicacy of its figures and faintneſs of the colouring; on which account it requires to be viewed very near.

Sect. I. *Of Drawing and deſigning.*

To ſucceed in this art, a man ſhould be perfectly ſkilled in the art of deſigning or drawing: but as moſt people who affect the one, know little or nothing of the other, and would have the pleaſure of painting without giving themſelves the trouble of learning to deſign (which is indeed an art that is not acquired without a great deal of time, and continual application), inventions have been found out to ſupply the place of it; by means of which a man deſigns or draws, without knowing how to deſign.

The firſt is chalking: that is, if you have a mind to do a print or deſign in miniature, the backſide of it on another paper, muſt be blackened with ſmall-coal, and then rubbed very hard with the finger wrapped in a linen cloth: afterwards the cloth muſt be lightly drawn over the ſide ſo blackened that no black grains may remain upon it to ſoil the vellum you would paint upon; and the print or draught muſt be faſtened upon the vellum with four pins, to keep it from ſhifting. And if it be another paper that is blackened, it muſt be put between the vellum and the print, or draught, with the blackened ſide upon the vellum. Then, with a blunted pin or needle, you muſt paſs over the principal lines or ſtrokes of the print, or draught, the contours, the plates of the drapery, and over every thing elſe that muſt be diſtinguiſhed; preſſing ſo hard, that the ſtrokes may be fairly marked upon the vellum underneath.

Copying by ſquares is another convenient method for ſuch as are but little ſkilled in the art of deſigning, and would copy pictures, or other things, that cannot be chalked. The method is this: The piece muſt be divided into many equal parts by little ſquares, marked out with charcoal; if the piece be clear and whitiſh, and the black can be fairly ſeen upon it; or with white chalk, if it be too brown and duſky. After which, as many ſquares of equal dimenſions muſt be made on white paper, upon which the piece muſt be deſigned; becauſe, if this be done immediately upon vellum, (as one is apt to miſcarry in the firſt attempt), the vellum may be ſoiled with falſe touches. But when it is neatly done upon paper, it muſt be chalked upon the vellum in the manner before deſcribed. When the original and the paper are thus ordered, obſerve what is in each ſquare of the piece to be deſigned; as a head, an arm, a hand, and ſo forth; and place it in the correſponding part of the paper. And thus finding where to place all the parts of the piece, you have nothing to do but to form them well, and to join them together. By this method you may reduce or enlarge a piece to what compaſs you pleaſe, making the ſquares of your paper greater or leſs than thoſe of the original; but they muſt always be of an equal number.

To copy a picture, or other thing, in the ſame ſize and proportion, another method is, to make uſe of varniſhed paper, or of the ſkin of a hog's bladder, very tranſparent, ſuch as is to be had at the gold-beaters. Talc or iſinglaſs will likewiſe do as well. Lay any one of thoſe things upon your piece; through it you will ſee all the ſtrokes and touches, which are to be drawn upon it with a crayon or pencil. Then take it off; and faſtening it under paper or vellum, ſet up both againſt the light in the manner of a window; and with a crayon, or a ſilver needle, mark out upon the paper or vellum you have put uppermoſt, all the lines and touches you ſhall ſee drawn upon the varniſhed paper, bladder, talc, or iſinglaſs, you have made uſe of, and which will plainly appear through this window.

After this manner, making uſe of the window, or of glaſs expoſed to the light, you may copy all ſorts of prints, deſigns, and other pieces, on paper or vellum; laying and faſtening them under the paper or vellum upon which you would draw them. And it is a very good and a very eaſy contrivance for doing pieces of the ſame ſize and proportion.

If you have a mind to make pieces look another way, there is nothing to be done but to turn them; laying the printed or drawn ſide upon the glaſs, and faſtening the paper or vellum upon the back of it; remembering to let your lights fall on the left ſide.

A good method likewiſe to take a true copy of a picture in oil, is to give a touch of the pencil upon all the principal ſtrokes, with lake tempered with oil; and to clap upon the whole a paper of the ſame ſize: then paſſing the hand over it, the touches of the lake will ſtick and leave the deſign of your piece expreſſed upon the paper, which may be chalked like other things. But you muſt remember to take off with the crumb of bread what remains of the lake upon the picture before it be dry.

You muſt likewiſe make uſe of pounce, made of powdered charcoal put in a linen-rag; with which the piece you would copy muſt be rubbed, after you have pricked all the principal ſtrokes or touches, and faſtened white paper or vellum underneath.

But a ſurer and eaſier help than all theſe, for one who knows nothing of deſigning, is a mathematical compaſs; it is generally made of ten-pieces of wood, in form of rulers, half a quarter of an inch thick, half an inch broad, and a foot long, or more, according as you have a mind to draw pieces of a greater or leſs ſize. To facilitate the conſtruction of this inſtrument, a figure is given, with an explanation of the manner in which it is to be uſed.

Plate CCCXIV.

The little board A is to be of fir, and covered with linen or any other cloth; becauſe the piece you copy, and the vellum or paper you copy upon, muſt be fixed upon it. Upon this board muſt the compaſs alſo be fixed with a pin, by the end of the firſt foot B, deep enough to keep it cloſe, but not ſo deep as to hinder it from turning eaſily. When you have a mind to reduce things, place your original on the ſide of the foot C, and the vellum or paper you would draw upon on the ſide of the foot B; removing the vellum, or drawing it nearer, according as you intend to reduce or enlarge.

In order to enlarge a piece, you have nothing to do but to change the places of your original and your copy; placing the laſt towards C, and the other on the ſide of B.

And in both one and the other method, a crayon or leaden needle muſt be put in the foot under which the vellum lies; and a pin, a little blunted, in that over the original, with which all the traces are to be followed; conducting the pin with one hand, and with the other preſſing gently upon the crayon or needle that marks the vellum. When the crayon or needle bears ſufficiently upon the vellum, you have no occaſion to touch it.

By this inſtrument you may alſo draw in equal dimenſions: but in order to this, the compaſs muſt be fixed in another manner upon the board; for if it is to be faſtened upon it by the middle at D, your original and your copy muſt be fixed on each ſide of this middle foot, at the equal diſtances, or from corner to corner: that is, from C to E, when the pieces are large. One may likewiſe draw ſeveral copies at once of equal and different dimenſions.

When your piece is marked out upon the vellum, you muſt paſs with a pencil of very clear carmine over all the traces, to the end they may not be effaced as you work: then clean your vellum with a crumb of bread, that no black may remain upon it.

Your vellum muſt be paſted upon a little plate of braſs or wood, of the ſize you would make your piece, to keep it firm and tight: but this paſting muſt be on the edges of your vellum only, and behind the plate; for which purpoſe your vellum muſt exceed your plate above an inch on every ſide: for the part you paint upon muſt never be paſted; becauſe it would not only give it an ill look, but you could not take it off if you would. Cut off the little ſhags and locks of the vellum; and wetting the fair ſide with a linen-cloth dipped in water, clap the other upon the plate with a clean paper between them: ſo much as hangs over muſt be paſted upon the back of the plate, drawing it equally on all ſides, and hard enough to ſtretch it well.

Sect. II. *Of Materials.*

The chief colours made uſe of for painting in miniature, are

Carmine.
Venice and Florence lake.

Colours, &c.

Roſe pink.
Vermilion.
Red-lead.
Brown red.
Red orpiment.
Ultramarine.
Verditer.
Indigo.
Gall-ſtone.
Yellow-ochre.
Dutch pink.
Gamboge.
Naples yellow.
Pale maſticot.
Deep yellow maſticot.
Ivory-black.
Lamp-black.
True Indian ink.
Biſtre, or wood-ſoot.
Raw umber.
Burnt umber.
Sap-green.
Verdigris.
Flake-white.
Crayons of all colours.
Gold and ſilver ſhells.
Leaf-gold and leaf-ſilver.

The ſeven tranſparent colours, which are uſed where writing is ſeen through the colour.

Liquid
Lake.
Blue.
Yellow.
Graſs-green.
Dark-green.
Purple-colour.
Brown.

Moſt of theſe colours neceſſary for miniature-painting may eaſily be prepared by attending to the directions given under the article *Colour-Making*.

As colours taken from earth and other heavy matter are always too coarſe, be they never ſo well ground, eſpecially for delicate work, becauſe of a certain ſand remaining in them; the fineſt parts may be drawn out by diluting them with the finger in a cup of water. When they are well ſteeped, let them ſettle a while: then pour out the cleareſt, which will be at top, into another veſſel. This will be the fineſt, and muſt be let dry; and when it is uſed, muſt be diluted with gum-water.

If you mix a little of the gall of an ox, a carp, or an eel, particularly of the laſt, in green, black, grey, yellow, and brown, colours, it will not only take away their greaſy nature, but alſo give them a luſtre and brightneſs they have not of themſelves. The gall of eels muſt be taken out when they are ſkinned, and hung upon a nail to dry; and when you would uſe it, it muſt be diluted with brandy; add a little of it mixed with the colour you have diluted already. This likewiſe makes the colour ſtick better to the vellum, which it hardly does when it is greaſy: moreover, this gall hinders it from ſcaling.

Some colours are made clearer by fire; as yellow ochre, brown red, ultramarine, and umber: all others are darkened by it. But if you heat the ſaid colours with a ſharp fire, they change; for the brown-red becomes yellow; yellow ochre becomes red; umber reddens alſo. Ceruſs by fire takes the colour of citron, and is often called *maſticot*. Obſerve, that yellow ochre heated, becomes more tender than it was, and ſofter than brown red. Likewiſe brown red heated becomes ſofter than fine yellow ochre. Both are very proper. The fineſt and trueſt ultramarine, heated upon a red-hot iron, becomes more glittering; but it waſtes, and is coarſer and harder to work with in miniature.

All theſe colours are diluted in little cups of ivory, made on purpoſe, or in ſea-ſhells, with water in which gum arabic and ſugar-candy are put. For inſtance, in a glaſs of water put a piece of gum as big as a walnut, and half that quantity of ſugar-candy. This laſt hinders the colours from ſcaling when they are laid on, which they generally do when they want it, or the vellum is greaſy.

This gum-water muſt be kept in a neat bottle corked; and you never muſt take any out of it with a pencil that has colour upon it, but with a quill or ſome ſuch thing.

Some of this water is put in the ſhell with the colour, you would temper, and diluted with the finger till it be very fine. If it be too hard, you muſt let it ſoften in the ſhell with the ſaid water before you dilute it. Afterwards let it dry: and do thus with every colour, except lily-green, ſap-green, and gamboge, which muſt be tempered with fair water only. But ultramarine, lake, and biſtre, are to be more gummed than other colours.

If you make uſe of ſea-ſhells, you muſt let them ſteep two or three days beforehand in water: then cleanſe them in boiling-hot water, mixed with vinegar, in order to carry of a certain ſalt, which otherwiſe ſticks to them, and ſpoils the colours that are put to them.

To know whether colours are ſufficiently gummed, you have nothing to do but to give a ſtroke of the pencil upon your hand when they are diluted, which dries immediately; if they chap and ſcale, there is too much gum; if they rub out by paſſing the finger over them, there is too little. It may be ſeen likewiſe when the colours are laid on the vellum, by paſſing the finger over them. If they ſtick to it like a powder, it is a ſign there is not gum enough, and more muſt be put to the water with which you temper them: but take care you do not put too much; for that makes the colour extremely hard and dry. It may be known likewiſe by their glueineſs and brightneſs: ſo the more they are gummed, the darker they paint; and when you have a mind to give a greater ſtrength to a colour than it has of itſelf, you have nothing to do but to give it a great deal of gum.

Provide yourſelf with an ivory pallet, very ſmooth, as big as your hand; on one ſide of which the colours for the carnation, or naked parts of a picture, are to be ranged in the following manner. In the middle put a great deal of white, pretty largely ſpread; becauſe it is the colour moſt made uſe of: and upon the edge, from the left to the right, place the following colours at a little diſtance from the white.

Maſticot.
Dutch-pink.
Orpiment.

Colours, &c.

Yellow ochre.

Green; compoſed of verditer, Dutch pink, and white, in equal quantities.

Blue; made of ultramarine, indigo, and white, to a great degree of paleneſs.

Vermilion.

Carmine.

Biſtre, and

Black.

On the other ſide of the pallet, ſpread ſome white in the ſame manner as for the carnation. And when you have a mind to paint draperies, or other things, place near the white the colour you would make them of, in order to work, as ſhall be ſhown hereafter.

The uſe of good pencils is a great matter. In order to make a good choice, wet them a little; and if the hairs keep cloſe together as you turn them upon the finger, and make but one point, they are good: but if they cloſe not together, but make ſeveral points, and ſome are longer than others, they are good for nothing. When they are too ſharp-pointed, with only four or five hairs longer than the reſt, yet cloſing all together, they are, notwithſtanding, good; but they muſt be blunted with a pair of ſciſſars, taking care at the ſame time you do not clip away too much. It is proper to have two or three ſorts of them; the largeſt for laying the grounds and dead colouring, and the ſmalleſt for finiſhing.

To bring the hairs of your pencil to join cloſe together and make a good point, you muſt often put the pencil juſt between your lips when you are at work; moiſtening and preſſing it cloſe with the tongue, even when there is colour upon it; for if there be too much, ſome of it is taken off by this means, and enough left for giving fine and equal touches. You need not apprehend this will do you any harm. None of the colours for miniature, except orpiment, when they are prepared, have either ill taſte or ill quality. This expedient muſt eſpecially be uſed for dotting, and for finiſhing, particularly the naked parts of a picture, that the touches may be neat and fair, and not too much charged with colour. As for draperies and other things, as well in dead colouring as in finiſhing, it is ſufficient, in order to make the hairs of your pencil join well, and to unload it when it has too much colour, to draw it upon the edge of the ſhell, or upon the paper you muſt put upon your work to reſt your hand on, giving ſome ſtrokes upon it before you work upon your piece.

To work well in miniature, you muſt do it in a room that has but one window, and fix yourſelf very near it, with a table and deſk almoſt as high as the window; placing yourſelf in ſuch a manner, that the light may always come in on the left ſide, and never forward or on the right.

When you would lay a colour on all parts equally ſtrong, as for a ground, you muſt make your mixtures in ſhells, and put in enough for the thing you deſign to paint; for if there be not enough, it is a great chance but the colour you mix afterwards is too dark or too light.

Sect. III.. *Of Working.*

After having ſpoke of vellum, pencils, and colours, let us now ſhow how they are to be employed. In the firſt place, then, when you would paint a piece, be it carnation, drapery, or any thing elſe, you muſt begin by dead-colouring; that is to ſay, by laying your colours on with liberal ſtrokes of the pencil, in the ſmootheſt manner you can, as the painters do in oil; not giving it all the force it is to have for a finiſhing; that is, make the lights a little brighter, and the ſhades leſs dark, than they ought to be; becauſe in dotting upon them, as you muſt do after dead-colouring, the colour is always fortified, and would at laſt be too dark.

Of Working.

There are ſeveral ways of dotting; and every painter has his own. Some make their dots perfectly round; others make them a little longiſh; others hatch by little ſtrokes that croſs each other every way, till the work appears as if it had been wrought with dots. This laſt method is the beſt, the boldeſt, and the ſooneſt done: wherefore ſuch as would paint in miniature ought to uſe it, and to inure themſelves from the firſt to dot in the plump and the ſoft way; that is to ſay, where the dots are loſt, in a manner, in the ground upon which you work, and only ſo much appears as is ſufficient to make the work ſeem dotted. The hard and the dry way is quite the reverſe, and always to be avoided. This is done by dotting with a colour much darker than your ground, and when the pencil is not moiſtened enough with the colour, which makes the work ſeem rough and uneven.

Study likewiſe carefully to loſe and drown your colours one in another, ſo that it may not appear where they disjoin; and to this end, ſoften or allay your touches with colours that partake of both, in ſuch ſort that it may not appear to be your touches which cut and disjoin them. By the word *cut*, we are to underſtand what manifeſtly ſeparates and divides, and does not run in and blend itſelf with the neighbouring colours; which is rarely practiſed but upon the borders of drapery.

When your pieces are finiſhed, to heighten them a little, give them a fine air; that is to ſay, give, upon the extremity of the lights, ſmall touches with a colour yet lighter, which muſt be loſt and drowned with the reſt.

When the colours are dry upon your pallet or in your ſhells, in order to uſe them, they muſt be diluted with water. And when you perceive they want gum, which is ſeen when they eaſily rub off the hand or the vellum if you give a touch with them upon either, they muſt be tempered with gum-water inſtead of pure water, till they are in condition.

There are ſeveral ſorts of grounds for pictures and portraitures. Some are wholly dark, compoſed of biſtre, umbre, and Cologn earth, with a little black and white; others more yellow, in which is mixed a great deal of ochre; others greyer, which partake of indigo. In order to paint a ground, make a waſh of the colour or mixture you would have it, or according to that of the picture or portraiture you would copy; that is to ſay, a very light lay, in which there is hardly any thing but water, in order to ſoak the vellum. Then paſs another lay over that, ſomewhat thicker, and ſtrike it on very ſmoothly with large ſtrokes as quick as you can, not touching twice in the ſame place before it be dry; becauſe the ſecond [illegible] carries off

what

Of Working.

what has been laid on at the firſt, eſpecially when you lean a little too hard upon the pencil.

Other dark grounds are likewiſe made of a colour a little greeniſh: and thoſe are moſt in uſe, and the propereſt to lay under all ſorts of figures and portraitures; becauſe tkey make the carnation, or naked parts of a picture, appear very fine; are laid on very eaſily, and there is no occaſion to dot them, as one is often obliged to do the other, which are rarely made ſmooth and even at the firſt; whereas in theſe one ſeldom fails of ſucceſs at the firſt bout. To make them, you muſt mix black, Dutch pink, and white, all together; more or leſs of each colour, according as you would have them darker or lighter. You are to make one lay very light, and then a thicker, as of the firſt grounds. You may alſo make them of other colours, if you pleaſe; but theſe are the moſt common.

When you paint a holy perſon upon one of theſe grounds, and would paint a ſmall glory round the head of your figure, you muſt not lay the colour too thick in that part, or you may even lay none at all, eſpecially where this glory is to be very bright: but lay for the firſt time with white and a little ochre mixed together, of a ſufficient thickneſs; and in proportion as you go from the place of the head, put a little more ochre; and to make it looſe itſelf, and die away with the colour of the ground, hatch with a free ſtroke of the pencil, following the round of the glory, ſometimes with the colour of which it is made, and ſometimes with that of the ground, mixing a little white or ochre with the laſt when it paints too dark to work with: and do this till one be inſenſibly loſt in another, and nothing can be ſeen to disjoin them.

To fill an entire ground with a glory, the brighteſt part is laid on with a little ochre and white, adding more of the firſt in proportion as you come nearer the edges of the picture: and when the ochre is not ſtrong enough (for you muſt always paint darker and darker), add gall-ſtone, afterwards a little carmine, and laſtly biſtre. This firſt laying, or dead-colouring, is to be made as ſoft as poſſible; that is to ſay, let theſe ſhadowings loſe themſelves in one another without gap or interſection. Then the way is to dot upon them with the ſame colours, in order to drown the whole together; which is pretty tedious, and a little difficult, eſpecially when there are clouds of glory on the ground. Their lights muſt be fortified in proportion as you remove from the figure, and finiſhed as the reſt, by dotting and rounding the clouds: the bright and obſcure parts of which muſt run inſenſibly into one another.

For a day-ſky, take ultramarine and a good deal of white, and mix them together. With this make a lay, as ſmooth as you can, with a large pencil and liberal ſtrokes, as for grounds; applying it paler and paler as you deſcend towards the horizon; which muſt be done with vermilion or red lead, and with white of the ſame ſtrength with that where the ſky ends, or ſomething leſs; making this blue loſe itſelf in the red, which you bring down to the ſkirts of the earth, or tops of houſes; mixing towards the end gall-ſtone and a good deal of white, in ſuch a manner that the mixture be ſtill paler than the former, without any viſible interſection or parting between all theſe colours of the ſky.

Of Draperies.

When there are clouds in the ſky, you may ſpare the places where they are to be; that is to ſay, you need not lay on any blue there, but form them, if they are reddiſh, with vermilion, gall-ſtone, and white, with a little indigo; and if they are more upon the black, put in a good deal of the laſt; painting the lights of one and the other with maſticot, vermilion, and white, more or leſs of any of theſe colours, according to the ſtrength you would give them, or according to that of the original you copy; rounding the whole as you dot; for it is a difficult matter to lay them very ſmooth at the firſt painting: and if the ſky is not even enough, you muſt dot it alſo.

It is at your pleaſure to exempt the places of the clouds, for you may lay them upon the ground of the ſky; heightening the bright parts by putting a good deal of white, and fortifying the ſhadows by uſing leſs. This is the ſhorteſt way.

A night or ſtormy ſky is done with indigo, black, and white, mixed together; which is laid as for a day-ſky. To this mixture muſt be added ochre, vermilion, or brown-red, for the clouds; the lights of which are to be of maſticot, or red-lead, and a little white; now redder, now yellower, at diſcretion. And when it is a tempeſtuous ſky, and lightning appears in ſome places, be it blue or red, it is to be done as in a day-ſky, drowning and loſing the whole together at the firſt forming or dead-colouring, and at the finiſhing.

SECT. IV. *Of Draperies.*

To paint a blue drapery, put ultramarine near the white upon your pallet; and mix a part of the one with the other, till it makes a fine pale, and has a body. With this mixture you muſt form the brighteſt parts; and then adding more ultramarine, form ſuch as are darker; and go on after this manner till you come to the deepeſt plaits and the thickeſt ſhades, where you muſt lay pure ultramarine: and all this muſt be done as for a firſt-forming or dead-colouring: that is to ſay, laying the colour on with free ſtrokes of the pencil, yet as ſmooth as you can; loſing the lights in the ſhadows with a colour neither ſo pale as the light nor ſo dark as the ſhades. Then dot with the ſame colour as in the firſt-forming, but a ſmall matter deeper; that the dots may be fairly ſeen. All the parts muſt be drowned one in another, and the plaits appear without interſection. When the ultramarine is not dark enough to make the deeper ſhadows, how well ſoever it be gummed, mix a little indigo with it to finiſh them. And when the extremities of the lights are not bright enough, heighten them with white and a very little ultramarine.

A drapery of carmine is done in the ſame manner as the blue; except that in the darkeſt places there is to be a lay of pure vermilion, before you dead-colour with carmine, which muſt be applied at top; and in the ſtrongeſt ſhades, it muſt be gummed very much. To deepen it the more, mix a little biſtre with it.

There is likewiſe made another red drapery, which is firſt drawn with vermilion, mixing white with it to dead-colour the bright places, laying it pure and unmixed for thoſe that are darker, and adding carmine

Of Draperies.

mine for the grand ſhades. It is finiſhed afterwards, like other draperies, with the ſame colours. And when the carmine with the vermilion do not darken enough, work with the firſt alone, but only in the deepeſt of the ſhades.

A drapery of lake is made in the ſame manner with that of carmine; mixing a good deal of white with it for the bright places, and very little for thoſe that are dark. It is finiſhed likewiſe with dotting; but you have nothing to do with vermilion in it.

Violet-draperies are likewiſe done after this manner; after making a mixture of carmine and ultramarine, putting always white for the bright parts. If you would have your violet be columbine or dove-colour, there muſt be more carmine than ultramarine: but if you would have it bluer and deeper, put more ultramarine than carmine.

A drapery is made of a fleſh-colour, beginning with a lay made of white, vermilion, and very pale lake; and making the ſhades with the ſame colours, uſing leſs white in them. This drapery muſt be very pale and tender, becauſe the ſtuff of this colour is thin and light; and even the ſhades of it ought not to be deep.

To make a yellow drapery, put a lay of maſticot over all; then one of gamboge upon that, excepting the brighteſt places, where the maſticot muſt be left entire; the dead-colour with ochre, mixed with a little gamboge and maſticot, putting more or leſs of the laſt according to the ſtrength of the ſhades. And when theſe colours do not darken enough, add gall-ſtone. And gall-ſtone pure and unmixed is uſed for the thickeſt ſhades; mixing a little biſtre with it, if there be occaſion to make them ſtill darker. You finiſh by dotting with the ſame colours you dead-coloured with, and loſing the lights and the ſhades in one another.

If you put Naples-yellow, or Dutch-pink, in lieu of maſticot and gamboge, you will make another ſort of yellow.

The green drapery is made by a general lay of verditer; with which, if you find it too blue, mix maſticot for the lights, and gamboge for the ſhades. Afterwards add to this mixture lily-green or ſap-green, to ſhadow with; and as the ſhades are thicker, put more of theſe laſt greens, and even work with them pure and unmixed where they are to be extremely dark. You finiſh with the ſame colours, a little darker.

By putting more yellow, or more blue, in theſe colours, you may make different ſorts of greens as you pleaſe.

To make a black drapery, you dead-colour with black and white, and finiſh with the ſame colour, putting more black as the ſhades are thicker; and for the darkeſt, mix indigo with it, eſpecially when you would have the drapery appear like velvet. You may always give ſome touches with a brighter colour, to heighten the lights of any drapery whatſoever.

A white woollen drapery is made by a lay of white, in which there muſt be a very ſmall matter of ochre, orpiment, or gall-ſtone, that it may look a little yellowiſh. Then dead-colour, and finiſh the ſhades with blue, a little black, white, and biſtre; putting a great deal of the laſt in the darkeſt.

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The light-grey is begun with black and white, and finiſhed with the ſame colour deeper.

For a brown drapery, make a lay of biſtre, white, and a little brown red; and ſhadow with this mixture, made a little darker.

There are other draperies, called *variable*, becauſe the lights are of a different colour from the ſhades. Theſe are moſtly uſed for the veſtments of angels, for young and gay people, for ſcarfs and other airy attire, admitting of a great many folds, and flowing at the pleaſure of the wind. The moſt common are the violets: of which they make two ſorts; one, where the lights are blue; and the other, where they are yellow.

For the firſt, put a lay of ultramarine and very pale white upon the lights; and ſhadow with carmine, ultaramarine, and white, as for drapery wholly violet; ſo that only the grand lights appear blue. Yet they muſt be dotted with violet, in which there is a great deal of white, and loſt inſenſibly in the ſhades.

The other is done by putting upon the lights only, inſtead of blue, a lay of maſticot; working the reſt as in the drapery all violet, excepting that it muſt be dotted, and the light parts blended with the ſhadowy, that is, the yellow with the violet, with a little gamboge.

The carmine-red is done like the laſt; that is, let the lights be done with maſticot, and the ſhades with carmine; and to loſe the one in the other, make uſe of gamboge.

The lake-red is done like that of carmine.

The green is done as the lake; always mixing verditer with lily or ſap green, to make the ſhades; which are not very dark.

Several other ſorts of draperies may be made at diſcretion, always taking care to preſerve the union of the colours, not only in one ſort of cloth or ſo, but alſo in a group of ſeveral figures; avoiding, as much as the ſubject will allow, the putting of blue near the colour of fire, of green againſt black; and ſo of other colours which cut and diſjoin, and whoſe union is not kind enough.

Several other draperies are made of foul colours, as brown-red, biſtre, indigo, &c. and all in the ſame manner. Likewiſe of other colours, ſimple and compound; the agreement between which is always to be minded, that the mixture may produce nothing harſh and diſagreeable to the eye. No certain rule can be laid down for this. The force and effect of your colours are only to be known from uſe and experience, and you muſt work according to that knowledge.

Linen cloths are done thus. After drawing the plaits or folds, as is done in a drapery, put a lay of white over all; then dead-colour and finiſh the ſhades with a mixture of ultramarine, black, and white, uſing more or leſs of the laſt, according to their ſtrength or tenderneſs; and in the greateſt deepenings put biſtre, mixed with a little white; giving only ſome touches of this mixture, and even of pure biſtre, upon the extremities of the greateſt ſhadows, where the folds muſt be drawn, and loſt with the reſt.

They may be done in another manner, by making a general lay of this mixture of ultramarine, black,

and

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and very pale white; and dead-colour (as has been ſaid before) with the ſame colour, but a little deeper. And when the ſhades are dotted and finiſhed, heighten the lights with pure white, and loſe them with the deepenings of the linen. But of whatever ſort you make them, when they are finiſhed, you muſt give a yellowiſh teint of orpiment and white to certain places; laying it lightly on, and as it were in water; ſo that what is underneath may, notwithſtanding, plainly appear, as well the ſhadows as the dotting.

Yellow linen-cloth is done by putting a lay of white, mixed with a little ochre. Then form and finiſh the ſhades with biſtre, mixed with white and ochre; and in the thickeſt ſhades uſe pure biſtre: and before you finiſh, give ſome teints here and there of ochre and white, and others of white and ultramarine, as well upon the ſhades as the lights; but let them be very bright: and drown the whole together in dotting, and it will look finely. As you finiſh, heighten the extremities of the lights with maſticot and white. You may add to this ſort of linen, as well as to the white, certain bars from ſpace to ſpace, as in Turkey-mantuas; that is, ſmall ſtripes blue and red with ultramarine and carmine; one of red between two of blue, very bright and clear upon the lights, and deeper upon the ſhades. Virgins are pretty often dreſſed with veils of this ſort (by Popiſh painters), and ſcarfs of this kind are put about necks that are bare; becauſe they become the teint mighty well.

If you would have both theſe ſorts of linen tranſparent, and the ſtuff or other thing that is beneath appear through them, make the firſt lay for them very light and clear, and mix in the colour to ſhadow with, a little of that which is underneath, eſpecially towards the end of the ſhades; and only do the extremities of the lights, for the yellow with maſticot and white; and for the white, with pure white.

They may be done in another manner, eſpecially when you would have them altogether as clear as muſlin, lawn, or gauze. To this end form and finiſh what is to be beneath, as if nothing was to be put over it. Then mark out the light and clear folds with white or maſticot; and a ſhadow with biſtre and white, or with black, blue, and white, according to the colour you would make them of: making the reſt ſomewhat fainter: yet this is not neceſſary but for the parts that are not to be ſo clear.

Crape is done the ſame way; excepting that the folds of the ſhades and the lights, and the borders too, are to be marked out with little filaments of black upon what is underneath; which is likewiſe to be finiſhed beforehand.

When you would make a ſtuff like watered tabby, make the waves upon it with a colour a little lighter, or a little darker, in the lights and the ſhades.

There is a manner of touching draperies which diſtinguiſhes the ſilken from the woollen. The laſt are more terreſtrial and ſenſible; the others more light and fading. But it muſt be obſerved that this is an effect which depends partly upon the ſtuff and partly upon the colour; and for the employing theſe in a manner ſuitable to the ſubjects and the deepenings of painting, we ſhall here touch upon their different qualities.

We have no colour which partakes more of light, nor which comes nearer the air, than white; which ſhows it to be fickle and fleeting. It may, nevertheleſs, be held and brought to by ſome neighbouring colour, more heavy and ſenſible, or by mixing them together.

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Blue is a moſt fleeting colour: and ſo we ſee, that the ſky and the remoteſt views of a picture are of this colour; but it will become ligher and fickler in proportion as it is mixed with white.

Pure black is the heavieſt and moſt terreſtrial of all colours; and the more of it you mix with others, the nearer you bring them to the eye.

Nevertheleſs, the different diſpoſitions of black and white make alſo their effects different: for white often makes black diſappear, and black brings white more into view; as in the reflection of globes, or other figures to be made round, where there are always parts that fly as it were from the eye, and deceive it by the craſt of art; and under the white are here comprehended all the light colours; as under the black, all the heavy colours.

Ultramarine is, then, ſoft and light.

Ochre is not ſo much ſo.

Maſticot is very light; and ſo is verditer.

Vermilion and carmine come near this quality.

Orpiment and gamboge not ſo near.

Lake holds a certain mean, rather ſoft than rough.

Dutch pink is an indifferent colour, eaſily taking the quality of others. So it is made terreſtrial by mixing it with colours that are ſo; and, on the contrary, the moſt light and fleeting by joining it with white or blue.

Brown-red, umber, dark-greens, and biſtre, are the heavieſt and moſt terreſtrial, next to black.

Skilful painters, who underſtand perſpective, and the harmony of colours, always obſerve to place the dark and ſenſible colours on the fore parts of their pictures; and the moſt light and fleeting they uſe for the diſtances and remote views. And as for the union of colours, the different mixtures that may be made of them will learn you the friendſhip or antipathy they have to one another. And upon this you muſt take your meaſures for placing them with ſuch agreement as ſhall pleaſe the eye.

For the doing of lace, French-points, or other things of that nature, put over all a lay of blue, black, and white, as for linen; then heighten the flower-work with pure white: afterwards make the ſhades above with the firſt colour, and finiſh them with the ſame. When they are upon the carnation or naked parts of a picture, or upon any thing elſe that you would ſhow through another, finiſh what is beneath, as if nothing was to be put over it: and at top, make the points or lace with pure white, ſhadowing and finiſhing them with the other mixture.

If you would paint a fur, you muſt begin with a kind of drapery, done, if it be dark, with biſtre and white, making the ſhadowings of the ſame colour, with leſs white. If the fur be white, do it with blue, white, and a little biſtre. And when this beginning, on firſt forming, is done, inſtead of dotting, draw ſmall ſtrokes, turning, now in one manner, now in another, according to the courſe and flatting of the hair. Heighten the lights of dark furs with ochre and white, and of the other with white and a little blue.

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For doing a building, if it be of ſtone, take indigo, biſtre, and white, with which make the beginning or firſt form of it; and for ſhadowing it, put leſs of this laſt; and more biſtre than indigo, according to the colour of the ſtone you would paint. To theſe you may likewiſe add a little ochre, both for the forming and the finiſhing. But to make it finer, you muſt give, here and there, eſpecially for old fabrics, blue and yellow teints, ſome with ochre, others with ultramarine, mixing always white with them, whether before the firſt-forming, provided they appear through the draught, or whether upon it, loſing or drowning them with the reſt when you finiſh.

When the building is of wood, as there are many ſorts, it is done at diſcretion; but the moſt ordinary way is to begin or firſt-form with ochre, biſtre, and white, and finiſh without white, or with very little; and if the ſhades are deep, with pure biſtre. In the other they add ſometimes vermilion, ſometimes green or black; in a word, juſt according to the colour they would give it, and they finiſh with dotting, as in draperies and every thing elſe.

Sect. V. *Of Carnations, or the naked parts of Painting.*

There are in carnation ſo many different colourings, that it would be a difficult thing to give general rules upon ſo variable a ſubject. Nor are they minded, when one has got, by cuſtom and practice, ſome habit of working eaſily: and ſuch as are arrived to this degree, employ themſelves in copying their originals, or elſe they work upon their ideas, without knowing how: inſomuch, that the moſt ſkilful, who do it with leſs reflection and pains than others, would likewiſe be more put to it to give an account of their maxims and knowledge in the matter of painting, if they were to be aſked what colours they made uſe of for ſuch and ſuch a colouring, a teint here, and another there.

Nevertheleſs, as beginners want ſome inſtruction at the firſt, we will ſhew in general after what manner ſeveral carnations are to be done.

In the firſt place, after having drawn your figure with carmine, and ordered your piece, apply, for women and children, and generally for all tender colourings, a lay of white, mixed with a very little of the blue made for faces, of which we have told the compoſition; but let it hardly be ſeen.

And for men, inſtead of blue, they put in this firſt lay a little vermilion; and when they are old, a little ochre is mixed with it.

Afterwards follow all the traces with vermilion, carmine and white, mixed together; and begin all the ſhades with this mixture, adding white in proportion as they are weaker; and putting but little in the darkeſt, and none, in a manner, in certain places where ſtrong touches are to be given: for inſtance, in the corner of the eye; under the noſe; at the ears; under the chin; in the ſeparation of the fingers; in all joints; at the corners of the nails; and generally in every part where you would mark out ſeparations in ſhades that are obſcure. Neither need you fear to give to thoſe places all the force and ſtrength they ought to have as ſoon as you begin or firſt-form them, becauſe in working at top with green, the red you have put there is always weakened.

After having begun, or firſt-formed, or dead-coloured, with red, make blue teints with ultramarine and a great deal of white, upon the parts which fly from the eye; that is to ſay, upon the temples; under and in the corners of the eyes; on both ſides the mouth, above and below; a little upon the middle of the forehead; between the noſe and the eyes; on the ſide of the cheeks; on the neck and other places where the fleſh aſſumes a bluiſh caſt. Yellowiſh teints are likewiſe made with ochre or orpiment, and a little vermilion mixed with white, under the eye-brows, on the ſides of the noſe towards the bottom, a little underneath the cheeks, and upon the other parts which riſe and come nearer the eye. It is eſpecially from theſe teints that the natural complexion is to be obſerved, in order to catch it; for painting being an imitation of nature, the perfection of the art conſiſts in the juſtneſs and ſimplicity of the repreſentation, eſpecially in face-painting.

When, therefore, you have done your firſt lay, your dead colouring, and your teints, you muſt work upon the ſhades, dotting with green for the carnations or naked parts, mixing according to the rule we have given for the teints, a little blue for the parts which fly from the eye; and, on the other hand, making it a little yellower for thoſe that are more ſenſible; that is to ſay, which riſe, and come nearer the eye: and at the end of the ſhades, on the ſide of the light, you muſt blend and loſe your colour inſenſibly in the ground of the carnation with blue, and then with red, according to the places where you paint. If this mixture of green does not work dark enough at firſt, paſs over the ſhades ſeveral times, now with red, and now with green; always dotting: and this do till they are as they ſhould be.

And if you cannot with theſe colours give the ſhades all the force they ought to have, finiſh, in the darkeſt, with biſtre mixed with orpiment, ochre, or vermilion, and ſometimes with pure biſtre, according to the colouring you would make, but lightly, laying on your colour very clear.

You muſt dot upon the clear and bright places with a little vermilion or carmine, mixed with much white, and a very ſmall matter of ochre, in order to loſe them with the ſhadowy, and to make the teints die away inſenſibly into one another; taking care, as you dot, or hatch, to make your ſtrokes follow the turnings and windings of the fleſhy parts. For though the rule be to croſs always, this dotting or hatching ought to appear a little more here, becauſe it rounds the parts. And as this mixture might make a colouring too red, if it was always to be uſed, they work likewiſe in every part, to blend the teints and the ſhades, with blue and a little green, and much white, ſo mixed as to be very pale; excepting, nevertheleſs, that this colour muſt not be put upon the cheeks, nor upon the extremities of the clear parts, no more than the other mixture upon theſe laſt, which muſt be left with all their light; as certain places of the chin, of the noſe, and of the forehead, and upon the cheeks; which ought nevertheleſs to be redder than the reſt, as well as the feet, the hollows of the hands, and the fingers of both.

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Obſerve, that theſe two laſt mixtures ought to be ſo pale, that the work ſhall hardly be viſible; for they ſerve only to ſoften it; to unite the teints with one another, and the ſhades with the lights, and to drown the traces. Care muſt likewiſe be taken that you work not too much with the red mixture upon the blue teints, nor with the blue upon the others; but change the colour from time to time, when you perceive it works too blue or too red, till the work be finiſhed.

The white of the eyes muſt be ſhadowed with this ſame blue, and a little fleſh-colour; and the corners, on the ſide of the noſe, with vermilion and white; giving them a little touch of carmine. The whole is ſoftened with this mixture of vermilion, carmine, white, and a very ſmall matter of ochre.

The apples or balls of the eyes are done with the mixture of ultramarine and white; the laſt prevailing a little; adding a little biſtre, if they are yellowiſh; or a little black, if they are grey. Make the little black circle in the middle, called the *cryſtal of the eye;* and ſhadow the balls with indigo, biſtre, or black, according to the colour they are of; giving to each a ſmall touch of pure vermilion round the cryſtal; which muſt be loſt with the reſt at the finiſhing. This gives vivacity to the eye.

The round or circumference of the eye is done with biſtre and carmine; that is to ſay, the ſlits or partings, and the eye-lids, when they are large and bold; eſpecially the upper ones; which muſt afterwards be ſoftened with the red or blue mixtures we have mentioned before, to the end they may be loſt in one another, and nothing ſeem interſected. When this is done, give a little touch of pure white upon the cryſtal, on the ſide of the lights. This makes the eye ſhine, and gives life to it.

The mouth is dead-coloured with vermilion, mixed with white; and finiſhed with carmine, which is ſoftened as the reſt. And when the carmine does not work dark enough, mix a little biſtre with it. This is to be underſtood of the corners in the ſeparation in the lips; and particularly, of certain mouths half open.

The hands, and all the other parts of carnation, are done in the ſame manner as the faces; obſerving, that the ends of the fingers be a little redder than the reſt. When your whole work is formed and dotted, mark the ſeparations of all the parts with little touches of carmine and orpiment mixed together, as well in the ſhadowy as the light places; but a little deeper and ſtronger in the firſt, and loſe them in the reſt of the carnation.

The eye-brows and the beard are dead-coloured, as are the ſhades of carnations; and finiſhed with biſtre, ochre, or black, according to the colour they are of, drawing them by little ſtrokes the way they ought to go; that is to ſay, give them all the nature of hair. The lights of them muſt be heightened with ochre and biſtre, a little vermilion, and much white.

For the hair of the head, make a lay of biſtre, ochre, and white, and a little vermilion. When it is very dark-coloured, uſe black inſtead of ochre. Afterwards form the ſhadowy parts with the ſame colours, putting leſs white in them; and finiſh with pure biſtre, or mixed with ochre or black, by ſmall ſtrokes very fine, and cloſe to each other, waving and buckling them according to the curling of the hair. The light parts muſt alſo be heightened by little ſtrokes with ochre or orpiment, white, and a little vermilion. After which, loſe the lights and the ſhades in each other, by working ſometimes with a dark and ſometimes with a light colour.

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And for the hair about the forehead, through which the ſkin is ſeen, it muſt be firſt formed with the colour thereof, and that of the carnation, working and ſhadowing with one and the other, as if you deſigned to paint none. Then form it, and finiſh with biſtre. The lights are to be heightened as the other. Grey hair is dead-coloured with white, black, and biſtre, and finiſhed with the ſame colour, but deeper; heightening the bright and clear parts of the hair, as well as thoſe of the eye brows and the beard, with white and very pale blue, after having formed them as the others, with the colour of the fleſh or ſkin; and finiſh with biſtre.

But the moſt important thing is to ſoften one's work; to blend the teints in one another, as well as the beard and the hair about the forehead, with the other hair and the carnation; taking eſpecial care not to work rough and dry; and that the traces, turnings, and windings of the carnation, or naked parts, be not interſected. You muſt likewiſe accuſtom yourſelf to put white in your colours only in proportion as you work lighter or darker: for the colour you uſe the ſecond time muſt be always a little ſtronger and deeper than the firſt, unleſs it be for ſoftening.

Different colourings are eaſily made, by putting more or leſs of red, or blue, or yellow, or biſtre, whether for the dead-colouring, or for the finiſhing.—That for women ought to be bluiſh; that for children a little red; and both freſh and florid. That for men ought to be yellower; eſpecially when they are old.

To make a colouring of death, there muſt be a firſt lay of white and orpiment, or a very pale ochre: dead-colour with vermilion, and lake, inſtead of carmine, and a good deal of white; and afterwards work over it with a green mixture, in which there is more blue than any other colour, to the end the fleſh may be livid and of a purple colour. The teints are done the ſame way as in another colouring; but there muſt be a great many more blue than yellow ones, eſpecially upon the parts which fly from the ſight, and about the eyes; and the laſt are only to be upon the parts which riſe and come nearer the eye. They are made to die away in one another, according to the ordinary manner; ſometimes with very pale blue, and ſometimes with ochre and white, and a little vermilion; ſoftening the whole together. The parts and contours muſt be rounded with the ſame colours. The mouth is to be, in a manner, of a quite violet. It is dead coloured, however, with a little vermilion, ochre, and white; but finiſhed with lake and blue: and to give it the deep ſtrokes, they take biſtre and lake; with which they likewiſe do the ſame to the eyes, the noſe, and the ears. If it is a crucifix, or ſome martyr, upon whom blood is to be ſeen, after the finiſhing the carnation, form it with vermilion, and finiſh it with carmine, making in the drops of blood a little bright reflecting ſpark, to round them. For the crown of thorns, make a lay of ſea-green and maſticot;

ſhadow

Of Carnations ſhadow it with biſtre and green; and heighten the clear and light parts with maſticot.

Iron is formed, or firſt laid, with indigo, a little black and white; and finiſhed with pure indigo, heightening it with white.

For painting fire and flames, the lights are done with maſticot and orpiment; and for the ſhades, they mix vermilion and carmine.

A ſmoke is done with black, indigo, and white, and ſometimes with biſtre; one may likewiſe add vermilion or ochre, according to the colour it is to be of.

Pearls are painted by putting a lay of white, and a little blue: they are ſhadowed and rounded with the ſame colour, deeper; a ſmall white dot is made almoſt in the middle, on the ſide of the light; and on the other ſide, between the ſhadow and the edge of the pearl, they give a touch with maſticot, to make the reflection; and under the pearls is made a little ſhadow of the colour of the ground they are upon.

Diamonds are made with pure black; then they heighten them with little touches of white on the ſide of the light. It is the ſame thing for any other jewels you have a mind to paint: there is nothing to be done but to change the colour.

For making a figure of gold, put a lay of ſhell-gold, and ſhadow it with gall ſtone. Silver is done the ſame way; excepting that it muſt be ſhadowed with indigo.

One great means to acquire a perfection in the art, is to copy excellent originals. We enjoy with pleaſure and tranquillity the labour and pains of others. But a man muſt copy a great number before he is able to produce as fine effects: and it is better to be a good copier than a bad author.

Sect. VI. *Of Landſcapes.*

In the firſt place, after having ordered the economy of your landſcape as of your other pieces, you muſt form the neareſt grounds or lands, when they are to appear dark, with ſap or lily-green, biſtre, and a little verditer, to give a body to your colour; then dot with this mixture, but a little darker, adding ſometimes a little black to it.

For ſuch pieces of ground as the light falls upon, and which are therefore clear and bright, make a lay of ochre and white: then ſhadow and finiſh with biſtre. In ſome they mix a little green, particularly for ſhadowing and finiſhing.

There are ſometimes upon the fore-part certain reddiſh lands; which are dead-coloured with brown-red, white, and a little green; and finiſhed with the ſame, putting a little more green in them.

For the making of graſs and leaves upon the foreground, you muſt, when that is finiſhed, form with ſea-green, or verditer, and a little white; and for thoſe that are yellowiſh, mix maſticot. Afterwards ſhadow them with lily-green, or biſtre and gall-ſtone, if you would have them appear withered.

The grounds or lands at a little diſtance are formed with verditer, and ſhadowed and finiſhed with ſap-green, adding biſtre for ſome of the touches here and there.

Such as are at a greater diſtance, are done with ſea-green and a little blue; and ſhadowed with verditer.

Of Landſcapes In a word, the farther they go, the more bluiſh they are to be made; and the fartheſt diſtances ought to be of ultramarine and white; mixing in ſome places ſmall touches of vermilion.

Water is painted with indigo and white, and ſhadowed with the ſame colour, but deeper; and to finiſh it, inſtead of dotting, they do nothing but make ſtrokes and traces without croſſing; giving them the ſame turn with the waves, when there are any. Sometimes a little green muſt be mixed in certain places, and the light and clear parts heightened with pure white, particularly where the water foams.

Rocks are dead-coloured like buildings of ſtone; excepting that a little green is mixed for forming and ſhadowing them. Blue and yellow teints are made upon them, and loſt with the reſt in finiſhing. And when there are ſmall branches, with leaves, moſs, or graſs, when all is finiſhed, they are to be raiſed at top with green and maſticot. They may be made yellow, green, and reddiſh, for appearing dry, in the ſame manner as on the ground. Rocks are dotted as the reſt; and the farther they are off, the more greyiſh they are made.

Caſtles, old houſes, and other buildings of ſtone and wood, are done in the manner abovementioned; ſpeaking of thoſe things, when they are upon the firſt lines. But when you would have them appear at a diſtance, you muſt mix brown-red and vermilion, with much white; and ſhadow very tenderly with this mixture; and the farther they are off, the weaker are the ſtrokes to be for the ſeparations. If they are covered with ſlate, it is to be made bluer than the reſt.

Trees are not done till the ſky be finiſhed; one may, nevertheleſs, ſpare the places of them when they contain a good number; and however it be, ſuch as come near the eye, are to be dead-coloured with verditer, mixing ſometimes ochre; and ſhadowed with the ſame colours, adding lily green. Afterwards you muſt work leaves upon them by dotting without croſſing: for this muſt be done with ſmall longiſh dots, of a darker colour, and pretty full of it, which muſt be conducted on the ſide the branches go, by little tufts of a little darker colour. Then heighten the lights with verditer or ſea-green, and maſticot, making leaves in the ſame manner: and when there are dry branches or leaves, they are dead-coloured with brown-red or gall-ſtone, with white; and finiſhed with gall-ſtone, without white, or with biſtre.

The trunks of trees are to be dead-coloured with ochre, white, and a little green, for the light and clear parts; and for the dark, they mix black, adding biſtre and green for ſhadowing one and the other. Blue and yellow teints are likewiſe made upon them, and little touches given here and there with white and maſticot; ſuch as you ordinarily ſee upon the bark of trees.

The branches which appear among the leaves are done with ochre, verditer, and white; or with biſtre and white, according to the light they are placed in. They muſt be ſhadowed with biſtre and lily-green.

Trees, which are at a little diſtance, are dead-coloured with verditer and ſea-green; and are ſhadowed

Of Landſcape.

and finiſhed with the ſame colours, mixed with lily-green. When there are ſome which appear yellowiſh, lay with ochre and white, and finiſh with gall-ſtone.

For ſuch as are in the diſtances and remote views, you muſt dead-colour with ſea-green; with which, for finiſhing, you muſt mix ultramarine. Heighten the lights of one and the other with maſticot, by ſmall diſjoined leaves.

It is the moſt difficult part of landſcape, in manner of miniature, to leaf a tree well. To learn, and break one's hand to it a little, the way is to copy good ones; for the manner of touching them is ſingular, and cannot be acquired but by working upon trees themſelves; about which you muſt obſerve to make little boughs, which muſt be leafed, eſpecially ſuch as are below and toward the ſky.

And generally, let your landſcapes be coloured in a handſome manner, and full of nature and truth; for it is that which gives them all their beauty.

Sect. VII. *Of Flowers.*

It is an agreeable thing to paint flowers, not only on account of the ſplendour of their different colours, but alſo by reaſon of the little time and pains that are beſtowed in trimming them. There is nothing but delight in it: and, in a manner, no application. You maim and bungle a face, if you make one eye higher than another; a ſmall noſe with a large mouth; and ſo of other parts. But the fears of theſe diſproportions conſtrain not the mind at all in flower-painting; for unleſs they be very remarkable, they ſpoil nothing. For this reaſon moſt perſons of quality, who divert themſelves with painting, keep to flowers. Nevertheleſs, you muſt apply yourſelf to copy juſtly: and for this part of miniature, as for the reſt, we refer you to nature, for ſhe is your beſt model. Work, then, after natural flowers; and look for the teints and different colours of them upon your pallet: a little uſe will make you find them eaſily; and to facilitate this to you at the firſt, we ſhall, in the continuance of our deſign, ſhow the manner of painting ſome; for natural flowers are not always to be had; and one is often obliged to work after prints, where nothing is ſeen but graving.

It is a general rule, that flowers are deſigned and laid like other figures; but the manner of forming and finiſhing them is different: for they are firſt formed only by large ſtrokes and traces, which you muſt turn at the firſt the way the ſmall ones are to go, with which you finiſh; this turning aiding much thereto. And for finiſhing them, inſtead of hatching or dotting, you draw ſmall ſtrokes very fine, and very cloſe to one another, without croſſing; repaſſing ſeveral times, till your dark and your clear parts have all the force you would give them.

Of Roses.—After making your firſt ſketch, draw with carmine the red roſe, and apply a very pale lay of carmine and white. Then form the ſhades with the ſame colour, putting leſs white in it: and laſtly, with pure carmine, but very bright and clear at the firſt; fortifying it more and more as you proceed in your work, and according to the darkneſs of the ſhades. This is done by large ſtrokes. Then finiſh; working upon it with the ſame colour by little ſtrokes, which you muſt make go the ſame way with thoſe of the graving, if it be a print you copy; or the way the leaves of the roſe turn, if you copy after a painting, or after nature; loſing the dark in the clear parts, and heightening the greateſt lights, and the brighteſt or moſt lightſome leaves, with white and a little carmine. You muſt always make the hearts of roſes, and the ſide of the ſhadow darker than the reſt; and mix a little indigo for ſhadowing the firſt leaves, particularly when the roſes are blown, to make them ſeem faded. The ſeed is dead-coloured with gamboge; with which a little ſap-green is mixed for ſhadowing. Roſes ſtreaked with ſeveral colours, ought to be paler than others, that the mixture of colours may be better ſeen; which are done with carmine; a little darker in the ſhades, and very clear in the lights; always hatching by ſtrokes. For white roſes you muſt put a lay of white, and form and finiſh them as the red; but with black, white, and a little biſtre; and make the ſeed a little yellower. Yellow roſes are done by putting in every part a lay of maſticot, and ſhadowing them with gamboge, gall-ſtone, and biſtre; heightening the clear and light places with maſticot and white.

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The ſtiles, the leaves, and the buds of all ſorts of roſes are formed with verditer, with which is mixed a little maſticot and gamboge; and for ſhadowing them, they add ſap-green, putting leſs of the other colours when the ſhades are deep. The outſide of the leaves ought to be bluer than the inſide: wherefore it muſt be dead-coloured with ſea-green, and ſap-green mixed with that for ſhadowing, making the veins or fibres on this ſide clearer than the ground, and thoſe on the other ſide darker. The prickles which are upon the ſtiles and buds of roſes, are done with little touches of carmine, which are made to go every way; and for thoſe that are upon the ſtalks, they are formed with verditer and carmine, and ſhadowed with carmine and biſtre: making the bottom of the ſtalks more reddiſh than the top: *i. e.* you muſt mix with the green, carmine and pure biſtre.

Of Tulips.—As there is an infinity of tulips, different from one another, one cannot pretend to mention the colours with which they are all done. We will only touch upon the handſomeſt, called *ſtreaked;* and theſe ſtreaks are dead-coloured with very clear carmine in ſome places, and with darker in others; finiſhing with the ſame colour by little ſtrokes, which muſt be carried the ſame way with the ſtreaks. And in others is put firſt a lay of vermilion. Then they form them by mixing carmine, and finiſh them with pure carmine. In ſome they put Florence-lake over the vermilion inſtead of carmine. Some are done with lake and carmine mixed together, and with lake alone, or with white and lake for the firſt forming; whether it be roſe-pink or Florence-lake. There are ſome of a purple colour, which are formed with ultramarine, carmine, or lake, ſometimes bluer and ſometimes redder. The manner of doing both one and the other is the ſame: there is no difference but in the colours. You muſt, in certain places, as between the ſtreaks of vermilion, carmine, or lake, ſometimes put blue made of ultramarine and white, and ſometimes a very bright purple, which is finiſhed by ſtrokes as the reſt, and loſt with the ſtreaks. There are ſome

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likewiſe that have ſallow teints, that are made with lake, biſtre, and ochre, according as they are: but this is only in fine and rare tulips, and not in the common ones. For ſhadowing the bottom of them, they ordinarily take indigo and white for ſuch whoſe ſtreaks are of carmine. For ſuch as are of lake, they take black and white; with which, in ſome, biſtre is mixed, and in others green. Some are likewiſe to be ſhadowed with gamboge and umber, and always by ſtrokes and traces, that turn as the leaves turn. Other tulips are likewiſe done, called *bordered;* that is to ſay, the tulip is not ſtreaked but on the edges of the leaves, where there is a border. It is white in the purple; red in the yellow; yellow in the red; and red in the white. The purple is laid with ultramarine, carmine, and white; ſhadowing and finiſhing it with this mixture. The border is ſpared; that is to ſay, let only a light lay of white be put there, and let it be ſhadowed with very bright indigo. The yellow is formed with gamboge, and ſhadowed with the ſame colour, mixing ochre and umber or biſtre with it. The border is laid with vermilion, and finiſhed with a very ſmall matter of carmine. The red is formed with vermilion, and finiſhed with the ſame colour, mixing carmine or lake with it. The bottom and the border are done with gamboge; and for finiſhing, they add gall-ſtone and umber, or biſtre. The white is ſhadowed with black, blue, and white. Indian ink is very proper for this. The ſhadowings of it are very tender. It produces alone the effect of blue and white, mixed with the other black. The border of this white tulip is done with carmine. In all theſe ſorts of tulips, they leave a nerve or ſinew in the middle of the leaves that are brighter than the reſt: and the borders are drowned at the bottom by ſmall traces, turning croſſwiſe; for they muſt not appear cut and ſeparated, as the ſtreaked or party-coloured. They make them likewiſe of ſeveral other colours. When they happen to be ſuch whoſe bottoms on the inſide are black, as it were, they form and finiſh them with indigo, as alſo the ſeed about the nozzle or ſtalk. And if the bottom is yellow, it is formed with gamboge, and finiſhed by adding umbre or biſtre. The leaves and the ſtalks of tulips are ordinarily formed with ſea-green, and ſhadowed and finiſhed with lily-green, by large traces all along the leaves. Some may likewiſe be done with verditer, mixing maſticot with it, and ſhadowed with ſap-green, that the green of the ſhades may be yellower.

The ANEMONY, or *Wind-flower.*—There are ſeveral ſorts of them, as well double as ſingle. The laſt are ordinarily without ſtreaks. Some are made of a purple colour, with purple and white, ſhadowing them with the ſame colour; ſome redder; others bluer; ſometimes very pale, and ſometimes very dark. Others are formed with lake and white, and finiſhed with the ſame, putting leſs white; ſome without any white at all. Others are formed with vermilion, and ſhadowed with the ſame colour, adding carmine. We ſee likewiſe white ones, and ſome of a citron colour. The laſt are laid with maſticot; and one and the other ſhadowed and finiſhed ſometimes with vermilion, and ſometimes with very brown lake, eſpecially near the ſeed, at the bottom; which is often likewiſe of a blackiſh colour, that is done with indigo, or black and

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blue, mixing for ſome a little biſtre; and always working by very fine ſtrokes and traces, and loſing the lights in the ſhades. There are others that are brighter and clearer at the bottom than any where elſe; and ſometimes they are perfectly white there, though the reſt of the flower be dark. The ſeed of all theſe anemonies is done with indigo and black, with a very little white, and ſhadowed with indigo; and in ſome it is raiſed with maſticot. The double anemonies are of ſeveral colours. The handſomeſt have their large leaves ſtreaked. Some are done, that is, the ſtreaked or party-coloured, with vermilion, to which carmine is added for the finiſhing; ſhadowing the reſt of the leaves with indigo; and for the ſmall leaves within, a lay is put of vermilion and white, and they are ſhadowed with vermilion mixed with carmine, mixing here and there ſome ſtronger touches, eſpecially in the heart of the flower, next the great leaves on the ſide of the ſhadow. They finiſh with carmine, by little ſtrokes and traces, turning the ſame way with the mixed or party-colours, and the leaves. They form and finiſh the ſtreaks or party-colours of ſome others, as well as the ſmall leaves, with pure carmine; leaving, nevertheleſs, in the middle of the laſt, a little circle, in which is laid dark purple, which is loſt with the reſt. And when all is finiſhed, they give ſome touches with this ſame colour round about the ſmall leaves, eſpecially on the ſide of the ſhadow; drowning them with the large ones, the remainder of which is ſhadowed either with indigo or black. In ſome, the ſmall leaves are done with lake or purple, though the party-colours of the large ones be done with carmine. There are others, whoſe mixed colours are done with carmine, in the middle of moſt of the large leaves; putting in ſome places vermilion underneath, and loſing theſe colours with the ſhadows of the bottom; which are done with indigo and white. The ſmall leaves are laid with maſticot, and ſhadowed with very dark carmine on the ſide of the ſhade, and with very clear on the ſide of the light, leaving there in a manner pure maſticot, and giving only ſome little touches with orpiment and carmine, to ſeparate the leaves, which may be ſhadowed ſometimes with a very little pale-green. There are double anemonies painted all red, and all purple. The firſt are formed with vermilion and carmine, in a manner without white, and ſhadowed with pure carmine, well gummed, that they may be very dark. Purple anemonies are laid with purple and white, and finiſhed with white. In a word, there are double anemonies as there are ſingle ones, of all colours; and they are done in the ſame manner. The green of one and the other is verditer; with which maſticot is mixed for forming. It is ſhadowed and finiſhed with ſap-green. The ſtiles of them are a little reddiſh; wherefore they are ſhadowed with carmine mixed with biſtre, and ſometimes with green, after having laid them with maſticot.

The CARNATION and the PINK.—It is with pinks and carnations as with anemonies and tulips; that is, there are ſome mixt-coloured, and others of one ſingle colour. The firſt are ſtreaked and diverſified ſometimes with vermilion and carmine; ſometimes with pure lake, or with white; ſome ſtreaks very dark, and others very pale; ſometimes by little ſtreaks and diverſifications, and ſometimes by large ones. Their bottoms are ordinarily ſhadowed with indigo and white. There are pinks of a very pale fleſh-colour, and ſtreaked and diverſified with another, a little deeper, made with vermilion and lake. Others, which are of lake and white, are ſhadowed and ſtreaked without white. Others, all red, which are done with vermilion and carmine as dark as poſſible. Others all of lake. And, laſtly, there are others, wherein nature or fancy is the rule. The green of one and the other is ſea-green, ſhadowed with lily-green or ſap-green.

The Red-lily.—It is laid with red lead, formed with vermilion, and in the deepeſt of the ſhades with carmine; and finiſhed with the ſame colour by ſtrokes and traces, turning as the leaves turn. The clear and light parts are heightened with red lead and white. The ſeed is done with vermilion and carmine. The green parts are done with verditer, ſhadowed with lily or ſap-green.

The Day-lily.—There are three ſorts of them:

1. The gridelin, a little red;
2. The gridelin, very pale; and,
3. The white.

For the firſt they put a lay of lake and white, and ſhadow and finiſh with the ſame colour deeper; mixing a little black to deaden it, eſpecially in the darkeſt places.

The ſecond are laid with white, mixed with a very little lake and vermilion, in ſuch a manner that theſe two laſt colours are hardly ſeen. Afterwards they ſhadow with black and a little lake, working redder in the middle of the leaves, next the ſtalks; which ought to be, as alſo the ſeed, of the ſame colour, particularly towards the top; and at the bottom a little greener.

The ſtile of the ſeed is laid with maſticot, and ſhadowed with ſap-green.

The other day-lilies are done by putting a lay of pure white, and ſhadowing and finiſhing with black and white.

The ſtalks of theſe laſt, and the greens of them all, are done with ſea-green, and ſhadowed with ſap-green.

The Hyacinth, or *Purple-flower*.—There are four ſorts of them:

The blue, a little dark;
Others paler;
The gridelin;
And the white.

The firſt are laid with ultramarine and white; and ſhadowed and finiſhed with leſs white. Others are laid and ſhadowed with pale blue. The gridelines are formed with lake and white, and a very ſmall matter of ultramarine; and finiſhed with the ſame colour a little deeper. For the laſt they put a lay of white; then they ſhadow them with black, with a little white; and finiſh them all by ſtrokes and traces, following the turnings and windings of the leaves. The green and the ſtalks of ſuch as are blue, are done with ſea and lily-green very dark: and in the ſtalks of the firſt may be mixed a little carmine, to make them reddiſh. The ſtalks of the two others, as alſo the green, are formed with verditer and maſticot, and ſhadowed with ſap-green.

The Piony.—A lay of Venice-lake and white muſt be put on all parts pretty ſtrong: then ſhadow with leſs white, and with none at all in the darkeſt places: after which finiſh with the ſame colour by traces, turning them as for the roſe; gumming it very much in the deepeſt of the ſhades; and raiſing the lights and the edges of the moſt lightſome leaves with white and a little lake. Little veins are likewiſe made, which go like the ſtrokes in hatching, but are more viſible. The green of this flower is done with ſea-green, and ſhadowed with ſap-green.

Cowslips.—They are of four or five colours. There are ſome of a very pale purple.

The gridelin. The white and the yellow.

The purple is done with ultramarine, carmine, and white; putting leſs white for ſhadowing. The gridelin is laid with Venice-lake, and a very ſmall matter of ultramarine, with much white; and ſhadowed with the ſame colour deeper. For the white, a lay of white muſt be put; and they muſt be ſhadowed with black and white; and finiſhed, as the others, by traces or ſtrokes. The heart of theſe cowſlips is done with maſticot, in the ſhape of a ſtar, which is ſhadowed with gamboge, making a little circle in the middle with ſap-green. The yellow are laid with maſticot, and ſhadowed with gamboge and umber. The ſtiles, the leaves, and the buds, are formed with verditer, mixed with a little maſticot, and finiſhed with ſap-green; making the fibres or veins, which appear upon the leaves, with this ſame colour; and heightening the lights of the largeſt with maſticot.

The Ranunculus, or *Crow-foot*.—There are ſeveral ſorts of them: the fineſt are the orange-coloured. For the firſt, they put a lay of vermillion, with a very ſmall matter of gamboge; and add carmine for ſhadowing; finiſhing it with this laſt colour, and a little gall-ſtone. In the others may be put Venice-lake, inſtead of carmine, eſpecially in the heart of the flower. The orange-coloured are laid with gamboge, and finiſhed with gall-ſtone, vermilion, and a little carmine; leaving ſome little yellow ſtreaks. The green of the ſtalks is done with verditer and very pale maſticot; mixing lily-green to ſhadow them. That of the leaves is a little darker.

The Crocus.—Theſe are of two colours:

Yellow and purple. The yellow are formed with maſticot and gall-ſtone, and ſhadowed with gamboge and gall-ſtone: after which, upon each leaf, on the outſide, are made three ſtreaks, ſeparate from one another, with biſtre and pure lake; which are loſt, by little traces, in the bottom. The outſide of the leaves is left all yellow.—The purple is laid with carmine, mixed with a little ultramarine, and very pale white. They are formed and finiſhed with leſs white; making likewiſe, in ſome, purple ſtripes or ſtreaks, very dark, as in the yellow; and in others only ſmall veins. The ſeed of both is yellow, and is done with orpiment and gall-ſtone. For the ſtiles, they put a lay of white, and ſhadow with black, mixed with a little green. The green of this flower is formed with very pale verditer, and ſhadowed with ſap-green.

The Iris.—The Perſian iris is done by putting, for the inſide leaves, a lay of white, and ſhadowing them with indigo and green together, leaving a little white ſeparation in the middle of each leaf; and for

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thoſe on the outſide, they put in the ſame place a lay of maſticot, which is ſhadowed with gall-ſtone and orpiment; making little dark and longiſh dots over all the leaf, at a ſmall diſtance from one another. And at the end of each are made large ſtains, with biſtre and lake in ſome, and in others with pure indigo, but very black. The reſt, and the outſide of the leaves, are ſhadowed with black. The green is formed with ſea-green, and very pale maſticot, and ſhadowed with ſap-green. The Suſian iris is laid with purple and white, putting a little more carmine than ultramarine; and for the ſhades eſpecially in the middle leaves, they put leſs white; and, on the contrary, more ultramarine than carmine; making the veins of this very colour, and leaving in the middle of the inſide leaves a little yellow ſinew. There are others which have this very ſinew in the firſt leaves; the end of which only is bluer than the reſt. Others are ſhadowed and finiſhed with the ſame purple, redder: They have alſo the middle ſinew on the outſide leaves; but white and ſhadowed with indigo. There are likewiſe yellow ones; which are done by putting a lay of maſticot and orpiment; ſhadowing them with gall-ſtone, and making the veins upon the leaves with biſtre. The green of one and the other is done with ſea-green, mixing a little maſticot for the ſtiles. They are ſhadowed with ſap-green.

The Jasmin.—It is done with a lay of white, and ſhadowed with black and white; and for the outſide of the leaves, they mix a little biſtre; making the half of each, on this ſide, a little reddiſh with carmine.

The Tuberose.—For the doing of this, they make a lay of white, and ſhadow with black, with a little biſtre in ſome places; and for the outſide of the leaves they mix a little carmine, to give them a reddiſh teint, particularly upon the extremities. The ſeed is done with maſticot, and ſhadowed with ſap-green. The green of it is laid with verditer, and ſhadowed with ſap-green.

The Hellebore.—The flower of hellebore is done almoſt in the ſame manner; that is, let it be laid with white, and ſhadowed with black and biſtre, making the outſide of the leaves a little reddiſh here and there. The ſeed is laid with dark green, and raiſed with maſticot. The green of it is foul and ruſty, and is formed with verditer, maſticot, and biſtre; and finiſhed with ſap-green and biſtre.

. The White lily.—It is laid with white, and ſhadowed with black and white. The ſeed is done with orpiment and gall-ſtone. And the green is done as in the tuberoſe.

The Snow-drop.—It is formed and finiſhed as the white lily. The ſeed is laid with maſticot, and ſhadowed with gall-ſtone. And the green is done with ſea and ſap-green.

The Jonquil.—It is laid with maſticot and gall-ſtone, and finiſhed with gamboge and gall-ſtone. The green is formed with ſea-green, and ſhadowed with ſap green.

The Daffodil.—All daffodils, the yellow, the double, and the ſingle, are done by putting a lay of maſticot: they are formed with gamboge, and finiſhed by adding umbre and biſtre; excepting the bell in the middle, which is done with orpiment and gall-ſtone, bordered or edged with vermilion and carmine. The white are laid with white, and ſhadowed with black and white; excepting the cup or bell, which is done with maſticot and gamboge. The green is ſea-green, ſhadowed with ſap-green.

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The Marigold.—It is done by putting a lay of maſticot, and then one of gamboge; ſhadowing it with this very colour, after vermilion is mixed with it: and for finiſhing, they add gall-ſtone and a little carmine. The green is done with verditer, ſhadowed with ſap-green.

The Austrian Rose.—For making the Auſtrian roſe, they put a lay of maſticot, and another of gamboge. Then they form it, mixing gall-ſtone; and finiſh it with the laſt colour, adding biſtre and a very ſmall matter of carmine in the deepeſt ſhades.

The Indian Pink, or *French Marigold*.—It is done by putting a lay of gamboge; ſhadowing it with this colour, after you have mixed a good deal of carmine and gall-ſtone with it; and leaving about the leaves a little yellow border of gamboge, very clear in the lights and darker in the ſhades. The ſeed is ſhadowed with biſtre. The green, as well of the roſe as the pink, is formed with verditer, and finiſhed with ſap-green.

The Sun-flower.—It is formed with maſticot and gamboge, and finiſhed with gall-ſtone and biſtre. The green is laid with verditer and maſticot, and ſhadowed with ſap-green.

The Passion-flower.—It is done as the roſe, and the green of the leaves likewiſe; but the veins are done with a darker green.

Poetical pinks and Sweet-william.—They are done by putting a lay of lake and white; ſhadowing them with pure lake, with a little carmine for the laſt; which are afterwards dotted on all parts with little round dots, ſeparate from one another; and the threads in the middle are raiſed with white. The green of them is ſea-green, which is finiſhed with ſap-green.

The Scabious.—There are two ſorts of ſcabious, the red and the purple. The leaves of the firſt are laid with Florentine lake, in which there is a little white; and ſhadowed without white: and for the middle, which is a great boſs or huſk in which the ſeed lies, it is formed and finiſhed with pure lake, with a little ultramarine or indigo to made it darker. Then they make little white longiſh dots over it, at a pretty diſtance from one another, clearer in the light than in the ſhade, making them go every way. The other is done by putting a lay of very pale purple, as well upon the leaves as the boſs in the middle; ſhadowing both with the ſame colour, a little deeper: and inſtead of little white touches for the ſeed, they make them purple; and about each grain they make out a little circle, and this over the whole boſs or huſk in the middle. The green is formed with verditer and maſticot, and ſhadowed with ſap-green.

The Sword or *Day-lily*.—It is laid with Florence lake, and very pale white; formed and finiſhed with pure lake, very clear and bright in ſome places, and very dark in others; mixing even biſtre in the thickeſt of the ſhades. The green is verditer, ſhadowed with ſap-green.

Hepatica, or *Liverwort*.—There is red and blue. The laſt is done by putting on all parts a lay of ultramarine, white, and a little carmine or lake; ſhadow-

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ing the inſide of the leaves with this mixture, but deeper; excepting thoſe of the firſt rank; for which, and for the outſide of every one of them, they add indigo and white, that the colour may be paler, and not ſo fine. The red is laid with lake-columbine and very pale white; and finiſhed with leſs white. The green is done with verditer, maſticot, and a little biſtre; and ſhadowed with ſap-green, and a little biſtre, eſpecially on the outſide of the leaves.

The Pomegranate.—The flower of the pomegranate is laid with red lead; ſhadowed with vermilion and carmine; and finiſhed with this laſt colour. The green is laid with verditer and maſticot, and ſhadowed with ſap green.

The Flower of the Indian Bean.—It is done with a lay of Levant-lake and white; ſhadowing the middle leaves with pure lake; and adding a little ultramarine for the others. The green is verditer, ſhadowed with ſap-green.

The Columbine.—There are columbines of ſeveral colours: the moſt common are the purple, the gridelin, and the red. For the purple, they lay with ultramarine, carmine, and white; and ſhadow with this mixture, deeper. The gridelin are done the ſame way, putting a great deal leſs ultramarine than carmine. The red are done with lake and white, finiſhing with leſs white. There are ſome mixed flowers of this kind, of ſeveral colours; which muſt be formed and finiſhed as the others, but paler, making the mixtures of a little darker colour.

The Lark's Heel.—Theſe are of different colours, and of mixed colours: the moſt common are the purple, the gridelin, and the red; which are done as the columbines.

Violets and Pansies.—Violets and panſies are done the ſame way; excepting that in the laſt the two middle leaves are bluer than the others, that is, the borders or edges; for the inſide of them is yellow: and their little black veins are made, which take their beginning from the heart of the flower, and die away towards the middle.

The Muscipula, or *Catch-fly*.—There are two ſorts of it, the white and the red; the laſt is laid with lake and white, with a little vermilion, and finiſhed with pure lake. As for the knot or nozzle of the leaves, it is formed with white and a very ſmall matter of vermilion, mixing biſtre or gall-ſtone to finiſh it. The leaves of the white are laid with white; adding biſtre and maſticot upon the knots, which are ſhadowed with pure biſtre, and the leaves with black and white. The green of all theſe flowers is done with verditer and maſticot, and ſhadowed with ſap-green.

The Crown Imperial.—There are of two colours, the yellow and the red. The firſt is done by putting a lay of orpiment, and ſhadowing it with gall-ſtone and orpiment, with a little vermilion. The other is laid with orpiment and vermilion, and ſhadowed with gall-ſtone and vermilion; making the beginning of the leaves next the ſtile, with lake and biſtre, very dark; and veins with this mixture, both in one and the other, all along the leaves. The green is done with verditer and maſticot, ſhadowed with ſap-green and gamboge.

The Cyclamen, or *Sowbread*.—The red is laid with carmine, a little ultramarine, and much white; and finiſhed with the ſame colour, deeper; putting, in a manner, only carmine in the middle of the leaves, next the heart, and in the reſt add a little more ultramarine. The other is laid with white, and ſhadowed with black. The ſtalks of one and the other ought to be a little reddiſh; and the green, verditer and ſap-green.

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The Gilliflower.—There are ſeveral ſorts of gilliflowers; the white, the yellow, the purple, the red, and the mixed, of various colours. The white are laid with white, and ſhadowed with black, and, with a little indigo in the heart of the leaves. The yellow, with maſticot, gamboge, and gall-ſtone. The purple are formed with purple and white; and finiſhed with leſs white; making the colour brighter in the heart, and even a little yellowiſh. The red with lake and white; finiſhing them with white. The mixed-coloured are laid with white, and the mixtures are ſometimes made with purple, in which there is much ultramarine; others again, in which there is more carmine. Sometimes they are of lake, and ſometimes of carmine. Some are done with white, and others without white; ſhadowing the reſt of the leaves with indigo. The ſeed of all is formed with verditer and maſticot, and finiſhed with ſap-green. The leaves and ſtiles are laid with the ſame green, mixing ſap-green to finiſh them.

Fruits, fiſhes, ſerpents, and all ſorts of reptiles, are to be touched in the ſame manner as the figures of men are; that is, hatched or dotted.

Birds and all other animals are done like flowers, by ſtrokes or traces.

Never make uſe, for any of theſe things, of white-lead. It is only proper in oil. It blackens like ink, when only tempered with gum; eſpecially if you ſet your work in a moiſt place, or where perfumes are. Ceruſs of Venice is as fine, and of as pure a white. Be not ſparing in the uſe of this, eſpecially in forming or dead colouring; and let it enter into all your mixtures, in order to give them a certain body, which will render your work gluiſh, and make it appear ſoft, plump, and ſtrong.

The taſte of painters is, nevertheleſs, different in this point. Some uſe a little of it, and others none at all, But the manner of the laſt is meagre and dry. Others uſe a great deal; and doubtleſs it is the beſt method, and moſt followed among ſkilful perſons: for beſides that it is ſpeedy, one may by the uſe of it copy all ſorts of pictures; which would be almoſt impoſſible otherwiſe; notwithſtanding the contrary opinion of ſome who ſay, that in miniature we cannot give the force and all the different teints we ſee in pieces in oil. But this is not true, at leaſt of good painters; and effects prove it pretty plainly: for we ſee figures, landſcapes, pictures, and every thing elſe in miniature, touched in as grand, as true, and as noble a manner (though more tender and delicate), as they are in oil.

However, painting in oil has its advantages; were they only theſe, that it exhibits more work, and takes up leſs time. It is better defended likewiſe againſt the injuries of time; and the right of birth muſt be granted it, and the glory of antiquity.

But miniature likewiſe has its advantages; and without repeating ſuch as have been mentioned already, it is neater and more commodious. You may eaſily carry all

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all your implements in your pockets, and work when and wherever you pleaſe, without ſuch a number of preparations. You may quit and reſume it when and as often as you will; which is not done in the other; in which one is rarely to work dry.

To conclude: In the art of painting, excellence does not depend upon the greatneſs of the ſubject, but upon the manner in which it is handled. Some catch the airs of a face well; others ſucceed better in landſcapes: ſome work in little who cannot do it in large: ſome are ſkilled in colours who know little of deſign: others, laſtly, have only a genius for flowers: and even the Baſſans got themſelves a fame for animals; which they touched in a very fine manner, and better than any thing elſe.

Minum | Minium.

MINIM, in muſic, a note equal to two crotchets, or half a ſemibreve. See Music.

MINIMS, a religious order in the church of Rome, founded by St Francis de Paula, towards the end of the 15th century. Their habit is a coarſe black woollen ſtuff, with a woollen girdle, of the ſame colour, tied in five knots. They are not permitted to quit their habit and girdle night nor day. Formerly they went bare-footed, but are now allowed the uſe of ſhoes.

MINIMUM, in the higher geometry, the leaſt quantity attainable in a given caſe.

MINISTER, a perſon who preaches, performs religious worſhip in public, adminiſters the ſacraments, &c.

Minister of State, a perſon to whom the prince intruſts the adminiſtration of government. See Council.

Foreign Minister, is a perſon ſent into a foreign country, to manage the affairs of his province or of the ſtate to which he belongs. Of theſe there are two kinds: thoſe of the firſt rank are ambaſſadors and envoys extraordinary, who repreſent the perſons of their ſovereigns; the miniſters of the ſecond rank are the ordinary reſidents.

MINIUM, or Red-lead, is a calx of lead of a vivid red colour, which colour it acquires by a ſlow calcination and reverberation. See Chemiſtry, n° 1213. The minium in commerce is chiefly brought from Holland, where large quantities of it are manufactured.

The method in which minium is made in large quantities in general is this—They firſt burn lead in a furnace into a kind of litharge, by continually ſtirring it while melted with an iron rake; this they afterwards grind with two pair of ſtones, which deliver it from one to another, the firſt pair grinding it coarſer, the ſecond finer; theſe are worked by means of a mill which moves ſix pair of them at once. When thus reduced to a fine powder, it is waſhed and then put into a furnace, and is burnt with a reverberatory fire for two or three days, all the while they continue ſtirring it with a large iron rake, hung on a ſwivel or iron hook; and toward the end of the time they watch its being of the right colour. When this is doing, the fire muſt not be carried beyond a certain degree, leſt the matter clod and run together.

The proceſs by which minium is prepared is deſcribed in the following manner by M. Jars *. The furnace is of the reverberatory kind, with two fire-places at the ends; each fire-place being ſeparated from the area, or body of the furnace, by a wall twelve inches high. The fire-places are fifteen inches broad, and their length is equal to the breadth of the whole furnace, which is about eight or nine feet. The length of the area from one place to the other is nine or ten feet. The quantity of lead uſed in one operation is about 1500 pounds, of which nine parts are lead obtained from furnaces where the ore is ſmelted, and one part is lead extracted from the ſcoria which is formed in ſmelting the ore. This latter kind is ſaid to be neceſſary, as the former could not alone be reduced into powder. All the lead is at once put into the area, the bottom of which is level. The calx, as faſt as it is formed, is drawn to one ſide, by means of a rake ſuſpended by a chain before the mouth of the furnace. In four or five hours the whole quantity of the lead is calcined, or, if any pieces remain uncalcined, they are ſeparated, and kept for the next operation. The heat employed is that of a cherry-red, and the fire-places and mouth are kept open, that the air may accelerate the calcination. The powder or calx is to be frequently ſtirred to prevent its concreting, and when this operation has been continued about 24 hours, the matter is taken out of the furnace, and laid on a flat pavement. Then cold water is thrown on it, to give it weight, as the workmen ſay; but rather (as M. Jars thinks) to make it friable. It is then to be ground in a mill, and the finer part is ſeparated by waſhing, while the coarſer part, reſerved for ſome following operation, is to be placed at the mouth of the furnace in order to retain the melted lead. The fine powder, which is now of a yellow colour, is again put into the ſame or a ſimilar furnace, and expoſed to a very moderate fire, from 36 to 48 hours; during which time, it is ſtirred frequently to prevent its concreting; and the powder gradually acquires its proper red colour. The minium is then to be taken out of the furnace, cooled, and ſifted through an iron ſieve placed in a caſk.

The bright colour of minium might render it valuable in painting, if it could ſtand with certainty in either oil or water. But as it is ſubject to become black, it cannot be ſafely truſted, except in hard varniſhes: and is, therefore, ſeldom uſed in oil, or even in water, unleſs for very groſs purpoſes, or as a ground for vermilion. The goodneſs of minium may be diſtinguiſhed by the brightneſs of its colour: and the adulteration to which it is liable may be detected by putting an ounce of it into a crucible with an equal quantity of charcoal duſt, well mixed together, and placing the crucible in a common fire ſufficient to melt lead, which is to be covered with another ſmall crucible inverted into it. When it has been continued for ſome time on the fire, take it out and ſtrike it againſt the ground. The minium will thus be reduced to its metallic ſtate; and its diminiſhed weight, when freed from the charcoal duſt and cold, will indicate the proportion of adulterated matter. Minium is alſo uſed as a flux in forming the enamel for grounds, and in glazing, &c.

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* Mem. de l'Acad. Royal, 1770.

In medicine, minium is uſed as an external application. It obtunds the acrimony of the humours, allays inflammations, and is excellent in the cleanſing and healing of old ulcers: It is uſed on theſe occaſions in many of the plaſters and ointments of the ſhops. It was an ingredient in the officinal compoſition called *emplaſtrum deminio*, employed as a deſiccative and cicatrizer; but now diſuſed for that made in the ſame manner with litharge, becauſe it does not ſtick ſo well, and is more difficult of preparation.

MINNIN, a ſtringed inſtrument of muſic among the ancient Hebrews, having three or four cords to it. See Plate CCCXIV. Though there is reaſon to queſtion the antiquity of this inſtrument; both becauſe it requires a hair-bow, which was a kind of plectrum not known to the ancients, and becauſe it ſo much reſembles the modern viol. Kircher took the figures of this, the machul, chinnor, and pſaltery, from an old book in th Vatican library.

MINOR, a Latin term, literally denoting *leſs*; uſed in oppoſition to *major*, greater.

Minor, in law, denotes a perſon under age; or who by the laws of the country, is not yet arrived at the power of adminiſtering his own affairs, or the poſſeſſion of his eſtate. Among us, a perſon is a minor till the age of twenty one: before which time his acts are invalid. See Age, and Infant.

It is a maxim in the common law of England, that in the King there is no minority, and therefore he hath no legal guardian; and his royal grants and aſſents to acts of parliament are good, though he has not in his natural capacity attained the legal age of twenty-one. It is alſo provided by the cuſtom and law of parliament, that no one ſhall ſit or vote in either houſe, unleſs he be twenty-one years of age. This is likewiſe expreſsly declared by ſtat. 7 and 8. Will. III. cap. 25. with regard to the houſe of commons.

Minor, in logic, is the ſecond repoſition of a formal or regular ſyllogiſm, called alſo the *aſſumption*.

Minor, in muſic, is applied to certain concords, which differ from or are lower than others of the ſame denomination by a leſſer ſemitone or four commas. Thus we ſay, a third minor, or leſſer third, or a ſixth major and minor. Concords that admit of major and minor, i. e. greater and leſs, are ſaid to be imperfect concords.

MINORCA, an iſland of the Mediterranean, ſituated between 39 and 40 degrees of North Latitude, and near four degrees of Eaſt Longitude. It is about 33 miles in length from north-weſt to ſouth-eaſt, in breadth from eight to twelve, but in general about ten miles; ſo that in ſize it may nearly equal the county of Huntingdon or of Bedfordſhire. The form is very irregular; and the coaſts are much indented by the ſea, which forms a great number of little creeks and inlets, ſome of which might be very advantageous.

This iſland is one of thoſe called by the ancient Romans *Balcares*, which aroſe from the dexterity of the inhabitants in uſing the ſling. It fell under the power of the Romans, afterwards of the northern barbarians, who deſtroyed that empire. From them it was taken by the Arabs, who were ſubdued by the king of Majorca, and he by the king of Spain. The Engliſh ſubdued it in 1708, and the French in the late war; but it was reſtored to Britain by the treaty of Paris in 1763.

The air of this iſland is much more clear and pure than in Britain; being ſeldom darkened with thick fogs: yet the low valleys are not free from miſts and unwholeſome vapours; and in windy weather the ſpray of the ſea is driven over the whole iſland. Hence it happens that utenſils of braſs or iron are extremely ſuſceptible of ruſt, in ſpite of all endeavours to preſerve them; and houſehold-furniture becomes mouldy. The ſummers are dry, clear, calm, and exceſſively hot; the autumns moiſt, warm, and unequal; at one time perfectly ſerene, at another cloudy and tempeſtuous. During the winter there are ſometimes violent ſtorms, though neither frequent nor of long continuance; and whenever they ceaſe, the weather returns to its uſual ſerenity. The ſpring is always variable, but reſembles the winter more than the ſummer. The changes of heat and cold are neither ſo great nor ſo ſudden in this climate as in many others. In the compaſs of a year, the thermometer ſeldom riſes much above the 80th, or falls below the 48th degree. In ſummer there is ſcarcely ever a difference of four or five degrees between the heat of the air at noon and at night; and in winter the variation is ſtill leſs conſiderable. But this muſt be underſtood of a thermometer ſhaded from the influence of the ſolar beams: for if expoſed to them it will often riſe 12, 14, or 16 degrees higher than what we have mentioned; and in other ſeaſons the difference between the heat of the air in the ſun and the ſhade is much greater. Yet, even in the dog days, the heat of the atmoſphere, at leaſt in open places, ſeldom ſurpaſſes that of human blood. The winds are very boiſterous about the equinoxes, and ſometimes during the winter. At other times they are generally moderate, and, according to the obſervations of ſeamen, they rarely blow in the ſame direction near the iſlands adjacent to the gulph of Lyons as in the open ſea. During the ſummer there is commonly a perfect calm in the mornings and evenings; but the middle of the day is cooled by refreſhing breezes which come from the eaſt, and, following the courſe of the ſun, increaſe gradually till two or three in the afternoon; after which they inſenſibly die away as night approaches. This renders the heat of the ſun leſs dangerous and inconvenient; and if theſe breezes intermit for a day or two, the natives grow languid and inactive from the heat. The northerly winds in general are clear and healthy, diſpel the miſts, and make a clear blue ſky; whilſt thoſe which blow from the oppoſite quarter, render the air warm, moiſt, and unhealthy. The north wind is ſuperior in power to all the reſt; which appears from hence, that the tops of all the trees incline to the ſouth, and the branches on the north ſide are bare and blaſted. The next to it in force is the north-weſt. Both are frequent towards the cloſe of winter and in the ſpring; and, being dry and cold, they ſhrivel up the leaves of the vegetables, deſtroy their tender ſhoots, and are often exceſſively detrimental to the vineyards and riſing

Minorca.

ſing corn. The piercing blaſts at that ſeaſon from the north-eaſt, as they are more moiſt and more frequently attended with rain, are leſs prejudicial. The ſouth and ſouth-eaſt winds are by much the moſt unhealthy. In whatever ſeaſons they blow, the air is foggy, and affects the breathing; but in the ſummer ſeaſon they are ſultry and ſuffocating. An exceſſive dejection of ſpirits is then a univerſal complaint; and on expoſing the thermometer to the rays of the ſun, the mercury has frequently riſen above the 100th degree. The weſt wind is uſually drier than the ſouth: the eaſt is cold and bluſtering in the ſpring, and ſultry in the ſummer.

The weather in Minorca is generally fair and dry; but when it rains, the ſhowers are heavy, though of ſhort continuance, and they fall moſt commonly in the night. The ſky in ſummer is clear, and of a beautiful azure, without clouds or rain; but moderate dews deſcend regularly after ſunſet. In autumn the weather becomes leſs ſerene; whirlwinds and thunder become frequent; and in the night-time lightning, and thoſe meteors called *falling ſtars*, are very common. Water-ſpouts alſo are often ſeen at that ſeaſon, and frequently break upon the ſhore. A ſudden alteration in the weather takes place about the autumnal equinox; the ſkies are darkened with clouds, and the rains fall in ſuch quantities, that the torrents thereby occaſioned, pouring down from the hills, tear up trees by the root, carry away cattle, break down fences, and do conſiderable miſchief to the gardens and vineyards. But theſe anniverſary rains are much more violent than laſting; always falling in ſudden and heavy ſhowers, with intervals of fair weather. They are accompanied with thunder, lightning, and ſquals of wind, moſt commonly from the north. Hail and ſnow are often intermixed with the rains which fall in winter and in ſpring; but the ſnow, for the moſt part, diſſolves immediately; and ice is here an uncommon appearance.

The whole coaſt of Minorca lies low; and there are only a few hills near the centre, of which the moſt conſiderable, named *Toro* by the inhabitants, may be ſeen at the diſtance of 12 or 14 leagues from the land. The ſurface of the iſland is rough and unequal; and in many places divided by long narrow vales of a conſiderable depth, called *barancoes* by the natives. They begin towards the middle of the iſland, and after ſeveral windings terminate at the ſea. The ſouth-weſt ſide is more plain and regular than towards the north-eaſt; where the hills are higher, with low marſhy valleys betwixt them, the ſoil leſs fruitful, and the whole tract unhealthy to man and beaſt. Near the towns and villages the fields are well cultivated, and incloſed with ſtone-walls; but the reſt for the moſt part are rocky, or covered with woods and thickets. There are ſome pools of ſtanding water, but very few rivulets, which is the greateſt defect about the iſland, as the inhabitants have ſcarcely any wholeſome water excepting what is ſaved from the clouds.

The ſoil is light, thin, and very ſtony, with a good deal of ſea-ſalt, and, in ſome places, of calcareous nitre intermixed. In moſt places there is ſo little earth, that the iſland appears to be but one large irregular rock covered here and there with mould, and an infinite variety of ſtones. Notwithſtanding this, however, it is not only extremely proper for vineyards, but produces more wheat and barley than could at firſt ſight be imagined; and, if the peaſants may be credited, it would always yield a quantity of corn and wine ſufficient for the natives, did not the violence of the winds, and the exceſſive drought of the weather, frequently ſpoil their crops. The fields commonly lie fallow for two years, and are ſown the third. About the latter end of winter, or the beginning of ſpring, they are firſt broke up: and next autumn, as ſoon as the rains fall, they are again ploughed and prepared for receiving the proper ſeeds. The tillage is very eaſily performed; for a plough ſo light as to be tranſported from place to place on the ploughman's ſhoulder, and to be drawn by an heifer, or an aſs ſometimes aſſiſted by an hog, is ſufficient for opening ſo thin a ſoil. The later the harveſt happens, the more plentiful it proves. The barley is uſually cut down about the 20th of May, N. S. and the wheat is reaped in June, ſo that the whole harveſt is commonly got in by midſummer-day. The grain is not threſhed with flails as in England, but trodden out on a ſmooth piece of rock by oxen and aſſes, according to the cuſtom of the eaſtern nations.

The natives of Minorca are commonly lean, thin, and well-built, of a middle ſtature, and olive complexion; but their character is by no means agreeable. Such is the natural impetuoſity of their temper, that the ſlighteſt cauſe provokes them to anger, and they ſeem to be incapable of forgiving or forgetting an injury. Hence quarrels break out daily, even among neighbours and relations; and family diſputes are tranſmitted from father to ſon; and thus, though lawyers and pettifoggers are very numerous in this country, there are ſtill too few for the clients. Both ſexes are, by conſtitution, extremely amorous; they are often betrothed to each other while children, and marry at the age of 14. The women have eaſy labours, and commonly return in a few days to their uſual domeſtic buſineſs; but, leſt the family ſhould become too numerous for their income, it is a practice among the poorer ſort to keep their children at the breaſt for two or three years, that by this means the mothers may be hindred from breeding.

Bread of the fineſt wheat flour, well fermented and well baked, is more than half the diet of people of all ranks. Rice, pulſe, vermicelli, herbs and roots from the garden, ſummer-fruits, pickled olives, and pods of the Guinea pepper, make up almoſt all the other half, ſo that ſcarce a fifth of their whole food is furniſhed from the animal kingdom; and of this fiſh makes by much the moſt conſiderable portion. On Fridays, and other faſt days, they abſtain entirely from fleſh; and during Lent they live altogether on vegetables and fiſh, excepting Sundays, when they are permitted the uſe of eggs, cheeſe, and milk. Moſt of their diſhes are high-ſeaſoned with pepper, cloves, cinnamon, and other ſpices; and garlic, onions, or leeks, are almoſt conſtant ingredients. They eat a great deal of oil, and that none of the ſweeteſt or beſt flavoured; uſing it not only with ſallads, but alſo with boiled and fried fiſh, greens, pulſe, &c. inſtead of butter. A ſlice of bread ſoaked in boiled water, with a little oil and ſalt, is the common breakfaſt of the peaſants, well known by the name of *oleagua*. Their ordinary meals are very frugal, and conſiſt of very little variety; but on feſtivals and other ſolemn occaſions their entertainments are to the laſt degree profuſe and extravagant, inſomuch that the bill of fare of a country farmer's wedding-dinner would ſcarce be credited.

With regard to other matters, the Minorquins are accuſed of prodigious indolence in the way of buſineſs, and neglect of the natural advantages they poſſeſs. In the bowels of the earth are iron, copper, and lead-ores, of none of which any uſe hath been made except the laſt. A lead-mine was worked to advantage ſome time ago, and the ore ſent into France and Spain for the uſe of the potteries in thoſe countries. The proprietor diſcontinued his work on ſome ſmall diſcouragement; and indeed it is ſaid, that theſe people are of all mankind the moſt eaſily put out of conceit with an undertaking that does not bring them in mountains of preſent gain, or that admits of the ſlighteſt probability of diſappointing their moſt ſanguine expectations: nor will their purſe admit of many diſappointments: and thus their poverty co-operating with their natural deſpondence and love of eaſe, is the principal cauſe of their backwardneſs to engage in projects, though ever ſo promiſing, for the improvement of their private fortune, and the advantage of the commerce of their country. This lead-ore went under the name of *vernis* among the natives, as it was wholly uſed by the potters in varniſhing and glazing their earthen veſſels.

There are few exports of any account, and they are obliged to their neighbours for near one-third of their corn, all their oil, and ſuch a variety of articles of leſs conſideration, that nothing could preſerve them from a total bankruptcy, but the Engliſh money circulated by the troops, which is exchanged for the daily ſupplies of proviſions increaſed by the multiplication of vineyards, the breeding of poultry, and the production of vegetables, in a proportion of at leaſt five to one ſince the iſland has been in poſſeſſion of the Britiſh. It will not require many words to enumerate their exports: they make a ſort of cheeſe, little liked by the Engliſh, which ſells in Italy at a very great price; this, perhaps, to the amount of 800 l. *per annum*.—The wool they ſend abroad may produce 900 l. more. Some wine is exported; and, if we add to its value that of the home-conſumption, which has every merit of an export, being nine parts in ten taken off by the troops for ready money, it may well be eſtimated at 1600 l. a-year. In honey, wax, and ſalt, their yearly exports may be about 400 l. and this comes pretty near the ſum of their exports, which we eſtimate together at 18,000 l. Sterling *per annum*.

A vaſt balance lies againſt them, if we conſider the variety and importance of the articles they fetch from other countries, for which they muſt pay ready caſh. Here it may be neceſſary to withdraw ſome things from the heap, ſuch as their cattle, ſheep, and fowls, on which they get a profit: for the country does not produce them in a ſufficient abundance to ſupply them, eſpecially when the Britiſh have a fleet of men of war ſtationed there.

Their imports are, corn, cattle, ſheep, fowls, tobacco, oil, rice, ſugar, ſpices, hard-ware, and tools of all kinds; gold and ſilver lace; chocolate, or cocoa to make it; tobacco, timber, plank, boards, mill-ſtones, tobacco-pipes, playing cards, turnery ware, ſeeds, ſoap, ſaddles; all manner of cabinet-makers work, iron ſpikes, nails, fine earthen-ware, glaſs-lamps, braſiery, paper, and other ſtationary wares; copperas, galls, dye-ſtuffs, painters bruſhes, and colours; muſical inſtruments, muſic, and ſtrings; watches, wine, fruit, all manner of fine and printed linens, muſlins, cambrics, and laces; bottles, corks, ſtarch, indigo, fans, trinkets, toys, ribbands, tape, needles, pins, ſilk, mohair, lanthorns, cordage, tar, pitch, roſin, drugs, gloves, fire-arms, gunpowder, ſhot, and lead; hats, caps, velvet, cotton ſtuffs, woollen cloths, ſtockings, capes, medals, veſtments, luſtres, pictures, images, agnus Dei's books, pardons, bulls, relics, and indulgencies.

The iſland is divided into what they ſtyle *terminos*, of which there were anciently five, now reduced to four, and reſemble our counties. The termino of Ciudadella, at the north-weſtern extremity of the iſland, is ſo ſtyled from this place, which was once a city, and the capital of Minorca. It makes a venerable and majeſtic figure, even in its preſent ſtate of decay, having in it a large Gothic cathedral, ſome other churches and convents, the governor's palace, and an exchange, which is no contemptible pile.—There are in it 600 houſes, which, before the ſeat of government and the courts of juſtice were removed to Mahon, were fully inhabited; and there are ſtill more gentlemens families here than in all the reſt of the iſland. It hath a port commodious enough for the veſſels employed in the trade of Britain, which though in the poſſeſſion of a maritime power, is leſs than it formerly was. It is ſtill, in the ſtyle of the officers, *the beſt quarters* (and there are none bad) in the country; and if there was a civil government, and the place made a free port, the beſt judges are of opinion it would very ſoon become a flouriſhing place again; and the fortifications, if it ſhould be found neceſſary, might then alſo be eaſily reſtored and improved,

The termino of Fererias is the next, a narrow ſlip reaching croſs from ſea to ſea, and the country little cultivated; it is therefore united to Mercandal. In this laſt termino ſtands Mont-toro in the very centre of the iſle, and the higheſt ground, ſome ſay the only mountain in it; on the ſummit of which there is a convent, where even in the hotteſt months the monks enjoy a cool air, and at all times a moſt delightful proſpect. About ſix miles north from Mont-toro ſtands the caſtle that covers Port Fornelles, which is a very ſpacious harbour on the eaſt ſide of the iſland. There are in it ſhoals and foul ground, which, to thoſe who are unacquainted with them, render it difficult and dangerous; yet the packets bound from Mahon to Marſeilles frequently take ſhelter therein; and while the Spaniards were in poſſeſſion of the iſle, large ſhips and men of war frequented it. At a ſmall diſtance from this lies another harbour called *Adaia*, which runs far into the land; but being reputed unſafe, and being ſo near Fornelles, is at preſent uſeleſs. The country about it is, however, ſaid to be the pleaſanteſt and wholeſomeſt ſpot in the iſland, and almoſt the only one plentifully ſupplied with excellent ſpring-water; ſo that the gardens are well laid out, and the richeſt and fineſt fruits grow here in the higheſt perfection. Alair is the next termino, in which there is nothing remarkable but the capital of the ſame name, well ſituated on an eminence, in a pleaſant and tolerably cultivated country.

The termino of Mahon, at the ſouth-eaſt end of the iſland, is at preſent the moſt conſiderable of them all, containing about 60,000 Engliſh acres, and nearly one-half of the inhabitants in Minorca. The town of Mahon derives its name from the Carthagenian general Mago, who is univerſally allowed to be its founder.— It ſtands on an eminence on the weſt ſide of the harbour, the aſcent pretty ſteep. There are in it a large church, three convents, the governor's palace, and ſome other public edifices. It is large, but the ſtreets are winding, narrow, and ill-paved. The fortreſs of St Philip ſtands near the entrance of the harbour, which it covers, is very ſpacious, of great ſtrength, with ſubterranean works to protect the garriſon from bombs, large magazines, and whatever elſe is neceſſary to render it a complete fortification, and hath a numerous and well-diſpoſed artillery. Port Mahon is allowed to be the fineſt harbour in the Mediterranean, about 90 fathoms wide at its entrance, but within very large and ſafe, ſtretching a league or more into the land. Beneath the town of Mahon there is a very fine quay, one end of which is reſerved for the ſhips of war, and furniſhed with all the accommodations neceſſary for careening and refitting them ; the other ſerves for merchantmen. On the other ſide the harbour is Cape Mola, where it is generally agreed a fortreſs might be conſtructed which would be impregnable, as the caſtle of St Philip was eſteemed before it was taken by the Britiſh, who beſtowed ſo much money upon it, that, though ſome works were erected at Cape Mola, it was not judged proper to proceed in the fortifications there at a freſh expence ; at leaſt this is the only reaſon that hath been aſſigned. Minorca was taken by the Spaniards during the American war, and is now in their poſſeſſion.

MINORS, or Friers Minor, an appellation which the Franciſcans aſſume, out of ſhew of humility ; calling themſelves *fratres minores*, i. e. leſſer brothers, and ſometimes *minorites*. There is alſo an order of regular minors at Naples, which was eſtabliſhed in the year 1588, and confirmed by Sextus V.

MINOS (fab. hiſt.), a king of Crete, ſon of Jupiter and Europa. He flouriſhed about 1432 years before the Chriſtian era. He gave laws to his ſubjects, which ſtill remained in full force in the age of the philoſopher Plato, about 1000 years after the death of the legiſlator. His juſtice and moderation procured him the appellation of the favourite of the gods, the confident of Jupiter, and the wiſe legiſlator, in every city of Greece ; and, according to the poets, he was rewarded for his equity after death with the office of ſupreme and abſolute judge in the infernal regions. In this capacity he is repreſented ſitting in the middle of the ſhades, and holding a ſcepter in his hand. The dead plead their different cauſes before him ; and the impartial judge ſhakes the fatal urn, which is filled with the deſtinies of mankind. He married Ithona, by whom he had Lycaſtes, who was the father of Minos II.

Minos II. was a ſon of Lycaſtes, the ſon of Minos I. and king of Crete. He married Paſiphae, the daughter of Sol and Perſeis, and by her he had many children. He increaſed his paternal dominions by the conqueſt of the neighbouring iſlands ; but ſhowed himſelf cruel in the war which he carried againſt the Athenians, who had put to death his ſon Androgeus. He took Megara by the treachery of Scylla ; and not ſatisfied with victory, he obliged the vanquiſhed to bring him yearly to Crete ſeven choſen boys, and the ſame number of virgins to be devoured by the Minotaur. This bloody tribute was at laſt aboliſhed when Theseus had deſtroyed the monſter. When Dædalus, whoſe induſtry and invention had fabricated the labyrinth, and whoſe imprudence in aſſiſting Paſiphae in the gratification of her unnatural deſires, had offended Minos, fled from the place of his confinement with wings, and arrived ſafe in Sicily ; the incenſed monarch purſued the offender, reſolved to puniſh his infidelity. Cocalus, king of Sicily, who had hoſpitably received Dædalus, entertained his royal gueſt with diſſembled friendſhip ; and, that he might not deliver to him a man whoſe ingenuity and abilities he ſo well knew, he put Minos to death. Minos died about 35 years before the Trojan war. He was father of Androgeus, Glaucus, and Deucalion ; and two daughters, Phædra and Ariadne. Many authors have confounded the two Minoſes, the grandfather and the grandſon ; but Homer, Plutarch, and Diodorus, prove plainly that they were two different perſons.

MINOTAUR (fab. hiſt.), a celebrated monſter, half a man and half a bull, according to this verſe of Ovid,

Semibovemque virum, ſemivirumque bovem.

It was the fruit of Paſiphae's amour with a bull. Minos refuſed to ſacrifice a white bull to Neptune, an animal which he had received from the god for that purpoſe. This offended Neptune, and he made Paſiphae the wife of Minos enamoured of this fine bull, which had been refuſed to his altars. Dædalus proſtituted his talents in being ſubſervient to the queen's unnatural deſires ; and by his means, Paſiphae's horrible paſſions were gratified, and the Minotaur came into the world. Minos confined in the labyrinth this monſter, which convinced the world of his wife's laſciviouſneſs, and reflected diſgrace upon his family. The Minotaur uſually devoured the choſen young men and maidens which the tyranny of Minos yearly exacted from the Athenians. Theſeus delivered his country from this tribute, when it had fallen to his lot to be ſacrificed to the voracity of the Minotaur ; and by means of Ariadne, the king's daughter, he deſtroyed the monſter, and made his eſcape from the windings of the labyrinth.—The fabulous tradition of the Minotaur, and of the infamous commerce of Paſiphae with a favourite bull, has been often explained. Some ſuppoſe that Paſiphae was enamoured of one of her huſband's courtiers called *Taurus ;* and that Dædalus favoured the paſſions of the queen, by ſuffering his houſe to become the retreat of the two lovers. Paſiphae ſome time after brought twins into the world, one of whom greatly reſembled Minos and the other Taurus ; and in the natural reſemblance of their countenance with that of their ſuppoſed fathers, originated their name, and conſequently the fable of the Minotaur.

MINOW, a very ſmall ſpecies of cyprinus, ſo well known that it needs no deſcription.

MINSTER (Saxon, *Mynſter* or *Mynſtre*), anciently ſignified the church of a monaſtery or convent.

MINSTREL, an ancient term for a ſinger and inſtrumental performer.

The word *minſtrel* is derived from the French *meneſtrier*, and was not in uſe here before the Norman conqueſt. It is remarkable, that our old monkiſh hiſtorians do not uſe the word *citharœdus*, *cantator*, or the like, to expreſs a *minſtrel* in Latin; but either *mimus*, *hiſtrio*, *joculator*, or ſome other word that implies *geſture*. Hence it ſhould ſeem that the minſtrels ſet off their ſinging by mimicry or action, or, according to Dr Brown's hypotheſis, united the powers of melody, poem, and dance.

The Saxons, as well as the ancient Danes, had been accuſtomed to hold men of this profeſſion in the higheſt reverence. Their ſkill was conſidered as ſomething divine, their perſons were deemed ſacred, their attendance was ſolicited by kings, and they were everywhere loaded with honours and rewards. In ſhort, poets and their art were held among them in that rude admiration which is ever ſhown by an ignorant people to ſuch as excel them in intellectual accompliſhments. When the Saxons were converted to Chriſtianity, in proportion as letters prevailed among them, this rude admiration began to abate, and poetry was no longer a peculiar profeſſion. The poet and the minſtrel became two perſons. Poetry was cultivated by men of letters indiſcriminately, and many of the moſt popular rhymes were compoſed amidſt the leiſure and retirement of monaſteries. But the minſtrels continued a diſtinct order of men, and got their livelihood by ſinging verſes to the harp at the houſes of the great. There they were ſtill hoſpitably and reſpectfully received, and retained many of the honours ſhown to their predeceſſors the Bards and Scalds. And indeed, though ſome of them only recited the compoſitions of others, many of them ſtill compoſed ſongs themſelves; and all of them could probably invent a few ſtanzas on occaſion. There is no doubt but moſt of the old heroic ballads were produced by this order of men. For although ſome of the larger metrical romances might come from the pen of the monks or others, yet the ſmaller narratives were probably compoſed by the minſtrels who ſung them. From the amazing variations which occur in different copies of theſe old pieces, it is evident they made no ſcruple to alter each other's productions, and the reciter added or omitted whole ſtanzas according to his own fancy or convenience.

In the early ages, as is hinted above, this profeſſion was held in great reverence among the Saxon tribes, as well as among their Daniſh brethren. This appears from two remarkable facts in hiſtory, which ſhow that the ſame arts of muſic and ſong were equally admired among both nations, and that the privileges and honours conferred upon the profeſſors of them were common to both; as it is well known their cuſtoms, manners, and even language, were not in thoſe times very diſſimilar.

When King Alfred the Great was deſirous to learn the true ſituation of the Daniſh army, which had invaded his realm, he aſſumed the dreſs and character of a minſtrel; and taking his harp, and only one attendant (for in the earlieſt times it was not unuſual for a minſtrel to have a ſervant to carry his harp), he went with the utmoſt ſecurity into the Daniſh camp. And though he could not but be known to be a Saxon, the character he had aſſumed procured him a hoſpitable reception; he was admitted to entertain the king at table, and ſtaid among them long enough to contrive that aſſault which afterwards deſtroyed them. This was in the year 878.

About 60 years after, a Daniſh king made uſe of the ſame diſguiſe to explore the camp of King Athelſtan. With his harp in his hand, and dreſſed like a minſtrel, Anlaff king of the Danes went among the Saxon tents, and taking his ſtand near the king's pavilion, began to play, and was immediately admitted. There he entertained Athelſtan and his lords with his ſinging and his muſic; and was at length diſmiſſed with an honourable reward, though his ſongs muſt have diſcovered him to have been a Dane. Athelſtan was ſaved from the conſequences of this ſtratagem by a ſoldier, who had obſerved Anlaff bury the money which had been given him, from ſome ſcruple of honour or motive of ſuperſtition. This occaſioned a diſcovery.

From the uniform procedure of both theſe kings, it is plain that the ſame mode of entertainment prevailed among both people, and that the minſtrel was a privileged character among both. Even as late as the reign of Edward II. the minſtrels were eaſily admitted into the royal preſence, as appears from a paſſage in Stow, which alſo ſhows the ſplendor of their appearance.

"In the year 1316, Edward II. did ſolemniſe his feaſt of Pentecoſt at Weſtminſter, in the great hall: where ſitting royally at the table with his peers about him, there entered a woman adorned like a minſtrel, ſitting on a great horſe trapped, as minſtrels then uſed, who rode round about the tables, ſhowing paſtime; and at length came up to the king's table, and laid before him a letter, and forthwith turning her horſe, ſaluted every one, and departed."—The ſubject of this letter was a remonſtrance to the king on the favours heaped by him on his minions, to the neglect of his knights and faithful ſervants.

The meſſenger was ſent in a minſtrel's habit, as what would gain an eaſy admiſſion; and was a woman concealed under that habit, probably to diſarm the king's reſentment: for we do not find that any of the real minſtrels were of the female ſex; and therefore conclude this was only an artful contrivance peculiar to that occaſion.

In the 4th year of Richard II. John of Gaunt erected at Tetbury in Staffordſhire, a court of minſtrels, with a full power to receive ſuit and ſervice from the men of his profeſſion within five neighbouring counties, to enact laws, and determine their controverſies; and to apprehend and arreſt ſuch of them as ſhould refuſe to appear at the ſaid court, annually held on the 16th of Auguſt. For this they had a charter, by which they were empowered to appoint a king of the minſtrels, with four officers, to preſide over them. Theſe were every year elected with great ceremony; the whole form of which is deſcribed by Dr Plott; in whoſe time, however, they ſeem to have become mere muſicians.

Even ſo late as the reign of King Henry VIII. the reciters of verſes or moral ſpeeches learnt by heart, intruded without ceremony into all companies; not only in taverns, but in the houſes of the nobility themſelves. This we learn from Eraſmus, whoſe argument led him only to deſcribe a ſpecies of theſe men who did not ſign their compoſitions; but the others that did, enjoyed without doubt the ſame privileges.

We find that the minſtrels continued down to the reign of Elizabeth; in whoſe time they had loſt much of their dignity, and were ſinking into contempt and neglect. Yet ſtill they ſuſtained a character far ſuperior to any thing we can conceive at preſent of the ſingers of old ballads.

When Queen Elizabeth was entertained at Killingworth caſtle by the earl of Leiceſter in 1575, among the many devices and pageants which were exhibited for her entertainment, one of the perſonages introduced was that of an ancient minſtrel, whoſe appearance and dreſs are ſo minutely deſcribed by a writer there preſent, and gives us ſo diſtinct an idea of the character, that we ſhall quote the paſſage at large.

"A perſon very meet ſeemed he for the purpoſe, of xlv. years old, apparelled partly as he would himſelf. His cap off: his head ſeemingly rounded tonſterwiſe: fair-kembed, that, with a ſponge daintly dipt in a little capon's greaſe, was finely ſmoothed, to make it ſhine like a mallard's wing. His beard ſnugly ſhaven: and yet his ſhirt after the new trink, with ruffs fair ſtarched, ſleeked and gliſtering like a pair of new ſhoes, marſhalled in good order with a ſetting ſtick, and ſtrut, 'that' every ruff ſtood up like a wafer. A ſide [i. e. long] gown of Kendale green, after the freſhneſs of the year now, gathered at the neck with a narrow gorget, faſtened afore with a white claſp and a keeper cloſe up to the chin; but eaſily, for heat, to undo when he liſt. Seemingly begirt in a red caddis girdle: from that a pair of capped Sheffield knives hanging a' two ſides. Out of his boſom drawn from a lappet of his napkin edged with a blue lace, and marked with a D for Damian; for he was but a batchelor yet.

"His gown had ſide [i. e. long] ſleeves down to mid leg, ſlit from the ſhoulder to the hand, and lined with white cotton. His doublet-ſleeves of black worſted: upon them a pair of pointes of tawny chamlet laced along the wriſt with blue threaden pointes. A wealt towards the hands of fuſtian-a-napes. A pair of red neather-ſtocks. A pair of pumps on his feet, with a croſs cut at his toes for corns; not new indeed, yet cleanly blackt with ſoot, and ſhining as a ſhoing horn.

"About his neck a red ribband ſuitable to his girdle. His harp in good grace dependent before him. His wreſt tyed to a green lace and hanging by: under the gorget of his gown a fair flaggon chain, (pewter for) ſilver, as a ſquire Minſtrel of Middleſex, that travelled the country this ſummer ſeaſon, unto fair and worſhipful mens houſes. From his chain hung a ſcutcheon, with metal and colour, reſplendent upon his breaſt, of the ancient arms of Iſlington."

—This minſtrel is deſcribed as belonging to that village. We ſuppoſe ſuch as were retained by noble families wore their arms hanging down by a ſilver chain as a kind of badge. From the expreſſion of Squire Minſtrel above, we may conclude there were other inferior orders, as Yeomen Minſtrels, or the like.

This minſtrel, the author tells us a little below, "after three lowly courteſies, cleared his voice with a hem . . . and wiped his lips with the hollow of his hand for 'ſiling his napkin; tempered a ſtring or two with his wreſt; and, after a little warbling on his harp for a prelude, came forth with a ſolemn ſong, warranted for ſtory out of King Arthur's acts, &c."

Towards the end of the 16th century, this claſs of men had loſt all credit, and were ſunk ſo low in the public opinion, that in the 39th year of Eliſabeth a ſtatute was paſſed by which "minſtrels, wandering abroad," were included among "rogues, vagabonds, and ſturdy beggars," and were adjudged to be puniſhed as ſuch. This act ſeems to have put an end to the profeſſion, for after this time they are no longer mentioned.

MINT, the place in which the king's money is coined. See COINAGE.

There were anciently mints in almoſt every county in England; but the only mint at preſent in the Britiſh dominions is that in the tower of London. The officers of the mint are, 1. The warden of the mint, who is the chief; he overſees the other officers, and receives the bullion. 2. The maſter-worker, who receives bullion from the warden, cauſes it to be melted, delivers it to the monyers, and, when it is coined, receives it again. 3. The comptroller, who is the overſeer of all the inferior officers, and ſees that all the money is made to the juſt aſſize. 4. The aſſay-maſter, who weighs the gold and ſilver, and ſees that it is according to the ſtandard. 5. The two auditors who take the accounts. 6. The ſurveyor of the melting; who, after the aſſay-maſter has made trial of the bullion, ſees that it is caſt out, and not altered after it is delivered to the melter. 7. The engraver; who engraves the ſtamps and dyes for the coinage of the money. 8. The clerk of the irons; who ſees that the irons are clean and fit to work with. 9. The melter who melts the bullion before it be coined. 10. The provoſt of the mint; who provides for and overſees all the moneyers. 11. The blanchers; who anneal and cleanſe the money. 12. The moneyers; ſome of whom forge the money, ſome ſhare it, ſome round and mill it, and ſome ſtamp and coin it. 13. The porters who keep the gate of the mint.

Mint was alſo a pretended place of privilege, in Southwark, near the King's Bench, put down by ſtatute. If any perſons, within the limits of the mint, ſhall obſtruct any officer in the ſerving of any writ or proceſs, &c. or aſſault any perſon therein, ſo as he receive any bodily hurt, the offender ſhall be guilty of felony, and be tranſported to the plantations, &c. Stat. 9. Geo. I.

MINT-Marks. It hath been uſual, from old time, to oblige the maſters and workers of the mint, in the indentures made with them, "to make a privy mark in all the money that they made, as well of gold as of ſilver, ſo that another time they might know, if need were, and witte which moneys of gold and ſilver among other of the ſame moneys, were of their own making, and which not." And whereas, after every trial of the pix at Weſtminſter, the maſters and workers of the mint, having there proved their moneys to be lawful and good, were immediately entitled to receive their *quietus* under the great ſeal, and to be diſ-

Mint.

Mint. ‖ Minyæ.

charged from all ſuits or actions concerning thoſe moneys, it was then uſual for the ſaid maſters and workers to change the privy mark before uſed for another, that ſo the moneys from which they were not yet diſcharged might be diſtinguiſhed from thoſe for which they had already received their *quietus*; which new mark they then continued to ſtamp upon all their moneys, until another trial of the pix gave them alſo their *quietus* concerning thoſe.

The pix is a ſtrong box with three locks, whoſe keys are reſpectively kept by the warden, maſter, and comptroller of the mint; and in which are depoſited, ſealed up in ſeveral parcels, certain pieces taken at random out of every *journey* as it is called; that is, out of every 15 pounds weight of gold, or 60 pounds weight of ſilver, before the ſame is delivered to the proprietors. And this pix is, from time to time, by the king's command, opened at Weſtminſter, in the preſence of the lord-chancellor, the lords of the council, the lords-commiſſioners of the treaſury, the juſtices of the ſeveral benches, and the barons of the exchequer; before whom a trial is made, by a jury of goldſmiths impanelled and ſworn for that purpoſe, of the collective weights of certain parcels of the ſeveral pieces of gold and ſilver taken at random from thoſe contained in the pix; after which thoſe parcels being ſeverally melted, aſſays are then made of the bullion of gold and ſilver ſo produced, by the melting certain ſmall quantities of the ſame againſt equal weights taken from the reſpective trial-pieces of gold and ſilver that are depoſited and kept in the exchequer for that uſe. This is called the *trial of the pix*; the report made by the jury upon that trial is called the *verdict of the pix* for that time; and the indented trial-pieces juſt abovementioned, are certain plates of ſtandard gold and ſtandard ſilver, made with the greateſt care, and delivered in upon oath, from time to time as there is occaſion, by a jury of the moſt able and experienced goldſmiths, ſummoned by virtue of a warrant from the lords of the treaſury to the wardens of the myſtery of goldſmiths of the city of London for that purpoſe; and which plates being ſo delivered in, are divided each, at this time, into ſeven parts by indentures, one of which parts is kept in his majeſty's court of exchequer at Weſtminſter, another by the ſaid company of goldſmiths, and two more by the officers of his majeſty's mint in the tower; the remaining three being for the uſe of the mint, &c. in Scotland. The pix has ſometimes been tried every year, or even oftener, but ſometimes not more that once in ſeveral years: and from hence is underſtood how it comes to paſs, that, among the pieces that are dated as well as marked, three or more different dates are ſometimes found upon pieces impreſſed with the ſame mark; and again, that different marks are found upon pieces bearing the ſame date. Theſe marks are firſt obſervable upon the coins of King Edward III.; the words above quoted concerning thoſe marks are from the indentures made with the lord Haſtings, maſter and worker to King Edward IV.; and the marks themſelves continued to be ſtamped very conſpicuouſly upon the moneys, till the coinage by the mill and ſcrew was introduced and ſettled after the reſtoration, in the year 1662: ſince which time, the moneys being made with far greater regularity and exactneſs than before, theſe marks have either been totally laid aſide, or ſuch only have been uſed as are of a more ſecret nature, and only known to the officers and engravers concerned in the coinage: and indeed the conſtant practice that has ever ſince prevailed, of dating all the ſeveral pieces, has rendered all ſuch marks of much leſs conſequence than before.

Mint, in botany. See Mentha.

MINTURNÆ, a town of Compania between Sinueſſa and Formiæ. It was in the marſhes in this neighbourhood that Marius concealed himſelf in the mud to avoid the partizans of Sylla. The people condemned him to death; but when his voice alone had terrified the executioner, they ſhowed themſelves compaſſionate and favoured his eſcape.

MINUET, a very graceful kind of dance, conſiſting of a coupee, a high ſtep, and a balance: it begins with a beat, and its motion is triple.

The invention of the minuet ſeems generally to be aſcribed to the French, and particularly to the inhabitants of the province of Poictou. The word is ſaid by Menage and Furetiere to be derived from the French *menue* or *menu*, "ſmall, or little;" and in ſtrictneſs ſignifies a ſmall pace. The melody of this dance conſiſts of two ſtrains, which, as being repeated, are called *repriſes*, each having eight or more bars, but never an odd number. The meaſure is three crotchets in a bar, and thus marked $\frac{3}{4}$, though it is commonly performed in the time $\frac{3}{8}$. Walther ſpeaks of a minuet in Lully's opera of *Roland*, each ſtrain of which contains ten bars, the ſectional number being 5; which renders it very difficult to dance.

MINUTE, in geometry, the 60th part of a degree of a circle.

Minute *of Time*, the 60th part of an hour.

Minute, in architecture, uſually denotes the 60th, ſometimes the 30th, part of a module. See Architecture.

Minute is alſo uſed for a ſhort memoir, or ſketch of a thing taken in writing.

MINUTIUS Felix. See Felix.

MINYÆ, a name given to the inhabitants of Orchomenos in Bœotia, from Minyas king of the country. Orchomenos the ſon of Minyas gave his name to the capital of the country; and the inhabitants ſtill retained their original appellation, in contradiſtinction to the Orchomenians of Arcadia. A colony of Orchomenians paſſed into Theſſaly and ſettled in Iolchos; from which circumſtance the people of the place, and particularly the Argonauts, were called *Minyæ*. This name they received, according to the opinion of ſome, not becauſe a number of Orchomenians had ſettled among them, but becauſe the chief and nobleſt of them were deſcended from the daughters of Minyas. Part of the Orchomenians accompanied the ſons of Codrus when they migrated to Ionia. The deſcendants of the Argonauts, as well as the Argonauts themſelves, received the name of *Minyæ*. They firſt inhabited Lemnos, where they had been born from the Lemnian women who had murdered their huſbands. They were driven from Lemnos by the Pelaſgi, about 1160 before the Chriſtian era, and came to ſettle in Laconia, from whence they paſſed into Calliſte with a colony of Lacedemonians.

Miquelets ‖ Mirabilis.

MIQUELETS, a name given to the Spaniards who inhabit the Pyrenean mountains on the frontiers of Arragon and Catalonia, and live by robbing.

MIQUELON, a ſmall deſart iſland to the ſouth-weſt of Cape May in Newfoundland, ceded to the French by the peace of 1763, for drying and curing their fiſh. W. Long. 54. 30. N. Lat. 47. 22.

MIRABILIS, Marvel, or Peru: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The corolla is funnel-ſhaped above; the calyx inferior; the nectarium globular, containing the germen. The moſt remarkable ſpecies are,

1. The jalappa or common marvel of Peru. It has a large, thick, fleſhy root; an upright, thick, jointed ſtalk, dividing and branching numerouſly, widely, and erectly, a yard or more high; garniſhed with oblong, broad, oppoſite leaves; and all the branches and ſhoots terminated by numerous flowers in cluſters, of different colours in the varieties. Of this there are varieties with white flowers—with yellow flowers—with purple flowers—with red flowers—with white and yellow flowers—white and purple flowers—purple and yellow flowers—red and yellow flowers Several other varieties often riſe from ſeed; and it is remarkable, that although ſeveral of the above colours and variegations are ſometimes common to the ſame plant, yet it is rare that a plant of this ſpecies produces flowers of one of thoſe colours alone; ſometimes, however, the ſame plant will exhibit only white and purple flowers ſeparate, and ſometimes both colours in the ſame flowers, intermixed with the plain ones: the ſame is alſo obſervable in the red and yellow; others have plain flowers of ſeveral different colours, and ſometimes variegated flowers alſo on the ſame plants. This ſpecies has a large tap root, which, when cut acroſs, is not unlike that of the true jalap; but, when dried, is white, light, and ſpungy. 2. The longiflora, or long-flowered mirabilis, hath a large, thick, fleſhy root; a thick ſtalk, dividing low into many declinated ſpreading branches, extending two or three feet every way; large, heart-formed, hairy, viſcous leaves, in oppoſite pairs: and all the branches and ſhoots terminated by white flowers in cluſters, having very long tubes, nodding downward. 3. The dichotoma, dichotomous, or forked mirabilis, has a thick fleſhy root; an upright, thick, ſwollen, jointed ſtem, branching forkedly two or three feet high; oblong oppoſite leaves; and ſmalliſh red flowers at the axillas, ſingly and cloſe-ſitting.

All theſe plants flower in July, continuing in plentiful ſucceſſion until October, very conſpicuous and elegant. They have the ſingularity of being ſhut all day, and expanding towards the evening when the ſun declines; hence the inhabitants of the Indies, where they grow naturally, called them *four o'clock flowers*: their time of opening here, however, depends on the weather; for, if cloudy, or that the ſun is not very vehement, they often open great part of the day. They are naturally perennial in root; but in this country are commonly conſidered as annuals: for they riſe from ſeed in the ſpring, and the ſame year produce flowers and perfect ſeed; and if left to nature in the open air, totally periſh in winter, at the firſt attack of froſt or exceſſive wet. If in autumn, however, when the ſtalks begin to aſſume a ſtate of decay, the roots are taken up, and preſerved in ſand in a dry room all winter, and planted again in ſpring, they ſhoot out afreſh ſtronger than at firſt, and ſometimes obtain four or five feet ſtature, with very ſpreading heads; or if plants growing in pots, having the ſtems cut down in autumn, and the pots placed in a green-houſe, or garden-frames under glaſſes, the roots may alſo be preſerved ſound, and will ſhoot out again in ſpring as above.

The roots of all theſe plants are purgative; but require to be given in a great quantity to operate equal to the true jalap, which is the ſpecies of convolvulus. See *Convolvulus*.

MIRACLE, in its original ſenſe, is a word of the ſame purport with *wonder*; but in its uſual and more appropriate ſignification, it denotes "an effect contrary to the eſtabliſhed conſtitution and courſe of things, or a ſenſible deviation from the known laws of nature."

That the viſible world is governed by ſtated general rules, or that there is an order of cauſes and effects eſtabliſhed in every part of the ſyſtem of nature which falls under our obſervation, is a fact which cannot be controverted. If the Supreme Being, as ſome have ſuppoſed, be the only real agent in the univerſe, we have the evidence of experience, that, in the particular ſyſtem to which we belong, he acts by ſtated rules. If he employs inferior agents to conduct the various motions from which the phenomena reſult, we have the ſame evidence that he has ſubjected thoſe agents to certain fixed laws, commonly called the *laws of nature*. On either hypotheſis, effects which are produced by the regular operation of theſe laws, or which are conformable to the eſtabliſhed courſe of events, are properly called *natural*; and every contradiction to this conſtitution of the natural ſyſtem, and the correſpondent courſe of events in it, is called a *miracle*.

If this definition of a miracle be juſt, no event can be deemed miraculous merely becauſe it is ſtrange, or even to us unaccountable; ſince it may be nothing more than a regular effect of ſome unknown law of nature. In this country earthquakes are rare; and for monſtrous births perhaps no *particular* and ſatisfactory account can be given: yet an earthquake is as regular an effect of the eſtabliſhed laws of nature as any of thoſe with which we are moſt intimately acquainted; and under circumſtances in which there would always be the ſame kind of production, the monſter is nature's genuine iſſue. It is therefore neceſſary, before we can pronounce any effect to be a true miracle, that the circumſtances under which it is produced be known, and that the common courſe of nature be in ſome degree underſtood: for in all thoſe caſes in which we are totally ignorant of nature, it is impoſſible to determine what is, or what is not, a deviation from its courſe. Miracles, therefore, are not, as ſome have repreſented them, appeals to our ignorance. They ſuppoſe ſome antecedent knowledge of the courſe of nature, without which no proper judgment can be formed concerning them; though with it their reality may be ſo apparent as to prevent all poſſibility of a diſpute.

Thus, were a phyſician to cure a blind man of a cataract, by anointing his eyes with a chemical preparation which we had never before ſeen, and to the nature and effects of which we are abſolute ſtrangers, the cure would undoubtedly be *wonderful*; but we could not pronounce it *miraculous*, becauſe, for any thing known to us, it might be the natural effect of the operation of the unguent on the eye. But were he to recover his patient merely by commanding him to ſee, or by anointing his eyes with ſpittle, we ſhould with the utmoſt confidence pronounce the cure to be a miracle; becauſe we know perfectly that neither the human voice nor human ſpittle have, by the eſtabliſhed conſtitution of things, any ſuch power over the diſeaſes of the eye. No one is now ignorant, that perſons apparently dead are often reſtored to their families and friends, by being treated in the manner recommended by the Humane Society. To the vulgar, and ſometimes even to men of ſcience, theſe effects appear very wonderful; but as they are known to be produced by phyſical agency, they can never be conſidered as miraculous deviations from the laws of nature. On the other hand, no one could doubt of his having witneſſed a real miracle who had ſeen a perſon that had been four days dead come alive out of his grave at the *call* of another, or who had even beheld a perſon exhibiting all the *ſymptoms* of death inſtantly reſuſcitated merely by being *deſired* to live.

Thus eaſy is it, in all caſes in which the courſe of nature is underſtood, to determine whether any particular event be really a miracle; whilſt in circumſtances where we know nothing of nature and its courſe, even a true miracle, were it performed, could not be admitted as ſuch, or carry any conviction to the mind of a philoſopher.

If miracles be effects contrary to the eſtabliſhed conſtitution of things, we are certain that they will never be performed on trivial occaſions. The conſtitution of things was eſtabliſhed by the Creator and Governor of the univerſe, and is undoubtedly the offſpring of infinite wiſdom purſuing a plan for the beſt of purpoſes. From this plan no deviation can be made but by God himſelf, or by ſome powerful being acting with his permiſſion. The plans deviſed by wiſdom are ſteady in proportion to their perfection, and the plans of infinite wiſdom muſt be abſolutely perfect. From this conſideration, ſome men have ventured to conclude, that no miracle was ever wrought, or can rationally be expected; but maturer reflection muſt ſoon ſatiſfy us that all ſuch concluſions are haſty.

Man is unqueſtionably the principal creature in this world, and apparently the only one in it who is capable of being made acquainted with the relation in which he ſtands to his Creator. We cannot, therefore, doubt, but that ſuch of the laws of nature as extend not their operation beyond the limits of this earth were eſtabliſhed chiefly, if not ſolely, for the good of mankind; and if, in any particular circumſtances, that good can be more effectually promoted by an occaſional deviation from theſe laws, ſuch a deviation may be reaſonably expected. Were man, in the exerciſe of his mental and corporeal powers, ſubjected to the laws of phyſical neceſſity, the circumſtances ſuppoſed would indeed never occur, and of courſe no miracle could be admitted. But ſuch is not the nature of man.

Without repeating what has been ſaid elſewhere (See METAPHYSICS, Part III. chap. v.) of neceſſity and liberty, we ſhall here take it for granted, that the relation between motives and actions is different from that between cauſe and effect in phyſics; and that mankind have ſuch command over themſelves, as that by their voluntary conduct, they can make themſelves in a great degree either happy or miſerable. We know likewiſe from hiſtory, that, by ſome means or other, almoſt all mankind were once ſunk into the groſſeſt ignorance of the moſt important truths; that they knew not the Being by whom they were created and ſupported; that they paid divine adoration to ſtocks, ſtones, and the vileſt reptiles; and that they were ſlaves to the moſt impious, cruel, and degrading ſuperſtitions.

From this depraved ſtate it was ſurely not unworthy of the common "Father of all" to reſcue his helpleſs creatures, to enlighten their underſtandings that they might perceive what is right, and to preſent to them motives of ſufficient force to engage them in the practice of it. But the underſtandings of ignorant barbarians cannot be enlightened by arguments; becauſe of the force of ſuch arguments as regard moral ſcience they are not qualified to judge. The philoſophers of Athens and Rome inculcated, indeed, many excellent moral precepts, and they ſometimes ventured to expoſe the abſurdities of the reigning ſuperſtition: but their lectures had no influence upon the multitude; and they had themſelves imbibed ſuch erroneous notions reſpecting the attributes of the Supreme Being, and the nature of the human ſoul, and converted thoſe notions into firſt principles, of which they would not permit an examination, that even among them a thorough reformation was not to be expected from the powers of reaſoning. It is likewiſe to be obſerved, that there are many truths of the utmoſt importance to mankind, which unaſſiſted reaſon could never have diſcovered. Amongſt theſe we may confidently reckon the immortality of the ſoul, the terms upon which God will be reconciled to ſinners, and the manner in which that all-perfect Being may be acceptably worſhipped; about all of which philoſophers were in ſuch uncertainty, that, according to Plato, "Whatever is ſet right, and as it ſhould be, in the preſent evil ſtate of the world, can be ſo only by the particular interpoſition of God (A)."

An immediate revelation from Heaven, therefore, was the only method by which infinite wiſdom and perfect goodneſs could reform a bewildered and vicious race. But this revelation, at whatever time we ſuppoſe it given, muſt have been made directly either to ſome choſen individuals commiſſioned to inſtruct others, or to every man and woman for whoſe benefit it was ultimately intended. Were every perſon inſtructed in

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(A) Ευ γαρ χρη ειδεναι, ὁ, τι περ αν σωθη τε και γενηται οιον δει, εν τοιαυτη καταστασει πολιτειων. Θεου μοιραν αυτο σωσαν De repub. Lib. 6.

in the knowledge of his duty by immediate inſpiration, and were the motives to practiſe it brought home to his mind by God himſelf, human nature would be wholly changed: men would not be maſters of their own actions; they would not be moral agents, nor by conſequence be capable either of reward or of puniſhment. It remains, therefore, that if God has been graciouſly pleaſed to enlighten and reform mankind, without deſtroying that moral nature which is eſſential to virtue, he can have done it only by revealing his truth to certain choſen inſtruments, who were the immediate inſtructors of their contemporaries, and through them have been the inſtructors of ſucceeding ages.

Let us ſuppoſe this to have been actually the caſe, and conſider how thoſe inſpired teachers could communicate to others every truth which had been revealed to themſelves. They might eaſily, if it was part of their duty, deliver a ſublime ſyſtem of natural and moral ſcience, and eſtabliſh it upon the common baſis of experiment and demonſtration; but what foundation could they lay for thoſe truths which unaſſiſted reaſon cannot diſcover, and which, when they are revealed, appear to have no neceſſary relation to any thing previouſly known? To a bare affirmation that they had been immediately received from God, no rational being could be expected to aſſent. The teachers might be men of known veracity, whoſe ſimple aſſertion would be admitted as ſufficient evidence for any fact, in conformity with the laws of nature; but as every man has the evidence of his own conſciouſneſs and experience that revelations from heaven are deviations from theſe laws, an aſſertion ſo apparently extravagant would be rejected as falſe, unleſs ſupported by ſome better proof than the mere affirmation of the teacher. In this ſtate of things, we can conceive no evidence ſufficient to make ſuch doctrines be received as the truths of God, but the power of working miracles committed to him who taught them. This would, indeed, be fully adequate to the purpoſe. For if there were nothing in the doctrines themſelves impious, immoral, or contrary to truths already known, the only thing which could render the teacher's aſſertion incredible, would be its implying ſuch an intimate communion with God as is contrary to the eſtabliſhed courſe of things, by which men are left to acquire all their knowledge by the exerciſe of their own faculties.—Let us now ſuppoſe ſome one of thoſe inſpired teachers to tell his countrymen, that he did not deſire them, on his *ipſe dixit*, to believe that he had any preternatural communion with the Deity, but that for the truth of his aſſertion he would give them the evidence of their own ſenſes; and after this declaration let us ſuppoſe him immediately to raiſe a perſon from the dead in their preſence, merely by calling upon him to come out of his grave. Would not the only poſſible objection to the man's veracity be removed by this miracle? and his aſſertion that he had received ſuch and ſuch doctrines from God be as fully credited, as if it related to the moſt common occurrence? Undoubtedly it would; for when ſo much preternatural *power* was viſibly communicated to this perſon, no one could have reaſon to queſtion his having received an equal portion of preternatural *knowledge*. A palpable deviation from the known laws of nature, in one inſtance, is a ſenſible proof that ſuch a deviation is poſſible in another; and in ſuch a caſe as this it is the witneſs of God to the truth of a man.

Miracles, then, under which we include prophecy, are the only direct evidence which can be given of divine inſpiration. When a religion, or any religious truth, is to be revealed from heaven, they appear to be abſolutely neceſſary to enforce its reception among men; and this is the only caſe in which we can ſuppoſe them neceſſary, or believe for a moment that they ever have been or will be performed.

The hiſtory of almoſt every religion abounds with relations of prodigies and wonders, and of the intercourſe of men with the gods: but we know of no religious ſyſtem, thoſe of the Jews and Chriſtians excepted, which appealed to miracles as the ſole evidence of its truth and divinity. The pretended miracles mentioned by Pagan hiſtorians and poets are not ſaid to have been publicly wrought to enforce the truth of a new religion contrary to the reigning idolatry. Many of them may be clearly ſhown to have been mere natural events; (ſee Magic). Others of them are repreſented as having been performed in ſecret on the moſt trivial occaſions, and in obſcure and fabulous ages long prior to the era of the writers by whom they are recorded. And ſuch of them as at firſt view appear to be beſt atteſted, are evidently tricks contrived for intereſted purpoſes; to flatter power, or to promote the prevailing ſuperſtitions. For theſe reaſons, as well as on account of the immoral character of the divinities by whom they are ſaid to have been wrought, they are altogether unworthy of examination, and carry in the very nature of them the completeſt proofs of falſehood and impoſture.

But the miracles recorded of Moſes and of Chriſt bear a very different character. None of them are repreſented as wrought on trivial occaſions. The writers who mention them were eye-witneſſes of the facts; which they affirm to have been performed publickly, in atteſtation of the truth of their reſpective ſyſtems. They are indeed ſo incorporated with theſe ſyſtems, that the miracles cannot be ſeparated from the doctrines; and if the miracles were not really performed, the doctrines cannot poſſibly be true. Beſides all this, they were wrought in ſupport of revelations which oppoſed all the religious ſyſtems, ſuperſtitions, and prejudices, of the age in which they were given: a circumſtance which of itſelf ſets them, in point of authority, infinitely above the Pagan prodigies, as well as the lying wonders of the Romiſh church.

It is indeed, we believe, univerſally admitted, that the miracles mentioned in the book of Exodus and in the four Goſpels, might, to thoſe who ſaw them performed, be ſufficient evidence of the divine inſpiration of Moſes and of Chriſt; but to us it may be thought that they are no evidence whatever, as we muſt believe in the miracles themſelves, if we believe in them at all, upon the bare authority of human teſtimony. Why, it has been ſometimes aſked, are not miracles wrought in all ages and countries? If the religion of Chriſt was to be of perpetual duration, every generation of men ought to have complete evidence of its truth and divinity.

To the performance of miracles in every age and in every country, perhaps the ſame objections lie as to the immediate inſpiration of every individual. Were

Miracle.

theſe miracles generally received as ſuch, men would be ſo overwhelmed with the *nature* rather than with the *proof* of their authority, as hardly to remain maſters of their own conduct; and in that caſe the very end of all miracles would be defeated by their frequency. The truth, however, ſeems to be, that miracles ſo frequently repeated would not be received as ſuch, and of courſe would have *no* authority; becauſe it would be difficult, and in many caſes impoſſible, to diſtinguiſh them from natural events. If they recurred regularly at certain intervals, we could not prove them to be deviations from the known laws of nature, becauſe we ſhould have the ſame experience for the one ſeries of events as for the other; for the regular ſucceſſion of preternatural effects, as for the eſtabliſhed conſtitution and courſe of things.

Be this, however, as it may, we ſhall take the liberty to affirm, that for the reality of the Goſpel miracles we have evidence as convincing to the reflecting mind, though not ſo ſtriking to vulgar apprehenſion, as theſe had who were contemporary with Chriſt and his apoſtles, and actually ſaw the mighty works which he performed. To the admirers of Mr Hume's philoſophy this aſſertion will appear an extravagant paradox; but we hope to demonſtrate its truth from principles which, conſiſtently with himſelf, that author could not have denied. He has indeed endeavoured to prove *, that "no teſtimony is ſufficient to eſtabliſh a miracle;" and the reaſoning employed for this purpoſe is, that "a miracle being a violation of the laws of nature, which a firm and unalterable experience has eſtabliſhed, the proof againſt a miracle, from the very nature of the fact, is as entire as any argument from experience can be; whereas our experience of human veracity, which (according to him) is the ſole foundation of the evidence of teſtimony, is far from being uniform, and can therefore never preponderate againſt that experience which admits of no exception." This boaſted and plauſible argument has with equal candour and acuteneſs been examined by Dr Campbell †; who juſtly obſerves, that ſo far is experience from being the ſole foundation of the evidence of teſtimony, that, on the contrary, teſtimony is the ſole foundation of by far the greater part of what Mr Hume calls firm and unalterable experience; and that if in certain circumſtances we did not give an implicit faith to teſtimony, our knowledge of events would be confined to thoſe which had fallen under the immediate obſervation of our own ſenſes. For a ſhort view of this celebrated controverſy, in which the Chriſtian ſo completely vanquiſhes the philoſopher, ſee the word ABRIDGEMENT.

But though Dr Campbell has expoſed the ſophiſtry of his opponent's reaſoning, and overturned the *principles* from which he reaſons, we are perſuaded that he might ſafely have joined iſſue with him upon thoſe very principles. To us, at leaſt, it appears that the teſtimony upon which we receive the Goſpel miracles is preciſely of that kind which Mr Hume has acknowledged ſufficient to eſtabliſh even a miracle. "No teſtimony (ſays he) is ſufficient to eſtabliſh a miracle, unleſs the teſtimony be of ſuch a kind that its falſehood would be more miraculous than the fact which it endeavours to eſtabliſh. When one tells me that he ſaw a dead man reſtored to life, I immediately conſider with myſelf whether it be more probable that this perſon ſhould either deceive or be deceived, or that the fact which he relates ſhould really have happened. I weigh the one miracle againſt the other; and according to the ſuperiority which I diſcover I pronounce my deciſion, and always reject the greater miracle." In this paſſage every reader may remark what did not eſcape the perſpicacious eye of Dr Campbell, a ſtrange confuſion of terms: but as all miracles are equally eaſy to the Almighty; and as Mr Hume has elſewhere obſerved, that "the raiſing of a feather, when the wind wants ever ſo little of a force requiſite for that purpoſe, is as real a miracle as the raiſing of a houſe or a ſhip into the air;" candour obliges us to ſuppoſe, that by talking of greater and leſs miracles, and of always rejecting the *greater*, he meant nothing more but that of two deviations from the known laws of nature he always rejects that which in itſelf is leaſt probable.

If, then, we can ſhow that the teſtimony given by the apoſtles and other firſt preachers of Chriſtianity to the miracles of their Maſter would, upon the ſuppoſition that thoſe miracles were not really performed, have been as great a deviation from the known laws of nature as the miracles themſelves, the balance muſt be conſidered as evenly poiſed by oppoſite miracles; and whilſt it continues ſo, the judgment muſt remain in a ſtate of ſuſpenſe. But if it ſhall appear, that in this caſe the falſe teſtimony would have been a deviation from the laws of nature leſs probable in itſelf than the miracles recorded in the Goſpels, the balance will be inſtantly deſtroyed; and by Mr Hume's maxim we ſhall be obliged to reject the ſuppoſition of falſehood in the teſtimony of the apoſtles, and admit the miracles of Chriſt to have been really performed.

In this argument we need not waſte time in proving that thoſe miracles, as they are repreſented in the writings of the New Teſtament, were of ſuch a nature, and performed before ſo many witneſſes, that no impoſition could poſſibly be practiſed on the ſenſes of thoſe who affirm that they were preſent. From every page of the Goſpels this is ſo evident, that the philoſophical adverſaries of the Chriſtian faith never ſuppoſe the apoſtles to have been themſelves deceived, but boldly accuſe them of bearing falſe witneſs. But if this accuſation be well founded, their teſtimony itſelf is as great a miracle as any which they record of themſelves or of their Maſter.

It has been ſhown elſewhere (ſee METAPHYSICS, n° 138.), that by the law of aſſociation, which is one of the laws of nature, mankind, in the very proceſs of learning to ſpeak, neceſſarily learn to ſpeak the truth; that ideas and relations are in the mind of every man ſo cloſely aſſociated with the words by which they are expreſſed in his native tongue, and in every other language of which he is maſter, that the one cannot be entirely ſeparated from the other; that therefore no man can on any occaſion ſpeak falſehood without ſome *effort*; that by no effort can a man give conſiſtency to an unpremeditated detail of falſehood, if it be of any length, and include a number of particulars; and that it is ſtill leſs poſſible for ſeveral men to agree in ſuch a detail, when at a diſtance from each other, and croſs-queſtioned by their enemies.

This being the caſe, it follows, if the teſtimony of the apoſtles to their own and their Maſter's miracles be falſe, either that they muſt have concerted a conſiſtent ſcheme of falſehood, and agreed to publiſh it at every hazard; or that God, or ſome powerful agent appointed by him, muſt have diſſolved all the aſſociations formed in their minds between ideas of ſenſe and the words of language, and arbitrarily formed new aſſociations, all in exact conformity to each other, but all in direct contradiction to truth. One or other of theſe events muſt have taken place; becauſe, upon the ſuppoſition of falſehood, there is no other alternative. But ſuch a diſſolution and formation of aſſociations as the latter implies, muſt, to every man who ſhall attentively conſider it, appear to be as real a miracle, and to require as great an exertion of power, as the reſurrection of the dead. Nor is the ſuppoſed voluntary agreement of the apoſtles in a ſcheme of falſehood an event leſs miraculous. When they ſat down to fabricate their pretended revelation, and to contrive a ſeries of miracles to which they were unanimouſly to appeal for its truth, it is plain, ſince they proved ſucceſsful in their daring enterpriſe, that they muſt have clearly foreſeen every poſſible circumſtance in which they could be placed, and have prepared conſiſtent anſwers to every queſtion that could be put to them by their moſt inveterate and moſt enlightened enemies; by the ſtateſman, the lawyer, the philoſopher, and the prieſt. That ſuch foreknowledge as this would have been miraculous, will not ſurely be denied; ſince it forms the very attribute which we find it moſt difficult to allow even to God himſelf. It is not, however, the *only* miracle which this ſuppoſition would compel us to ſwallow. The very *reſolution* of the apoſtles to propagate the belief of falſe miracles in ſupport of ſuch a religion as that which is taught in the New Teſtament, is as great a miracle as human imagination can eaſily conceive.

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* Eſſay on Miracles.

† Diſſertation on Miracles.

When they formed this deſign, either they muſt have hoped to ſucceed, or they muſt have foreſeen that they ſhould fail in their undertaking; and in either caſe, they *choſe evil for its own ſake.* They could not, if they foreſaw that they ſhould fail, look for any thing but that contempt, diſgrace, and perſecution, which were then the inevitable conſequences of an unſucceſsful endeavour to overthrow the eſtabliſhed religion. Nor could their proſpects be brighter upon the ſuppoſition of their ſucceſs. As they knew themſelves to be falſe witneſſes and impious deceivers, they could have no hopes beyond the grave: and by determining to oppoſe all the religious ſyſtems, ſuperſtitions, and prejudices of the age in which they lived, they wilfully expoſed themſelves to inevitable miſery in the preſent life, to inſult and impriſonment, to ſtripes and death. Nor can it be ſaid that they might look forward to power and affluence when they ſhould, through ſufferings, have converted their countrymen; for ſo deſirous were they of obtaining nothing but *miſery* as the end of their miſſion, that they made their own perſecution a teſt of the truth of their doctrines. They introduced the Maſter from whom they pretended to have received theſe doctrines as telling them, that "they were ſent forth as ſheep in the midſt of wolves; that they ſhould be delivered up to councils, and ſcourged in ſynagogues; that they ſhould be hated of all men for his name's ſake; that the brother ſhould deliver up the brother to death, and the father the child; and that he who took not up his croſs and followed after him was not worthy of him." The very ſyſtem of religion, therefore, which they invented and reſolved to impoſe upon mankind, was ſo contrived, that the worldly proſperity of its firſt preachers, and even their exemption from perſecution, was incompatible with its ſucceſs. Had theſe clear predictions of the Author of that religion, under whom the apoſtles acted only as miniſters, not been verified, all mankind muſt have inſtantly perceived that their pretence to inſpiration was falſe, and that Chriſtianity was a ſcandalous and impudent impoſture. All this the apoſtles could not but foreſee when they formed their plan for deluding the world. Whence it follows, that when they reſolved to ſupport their pretended revelation by an appeal to forged miracles, they wilfully and with their eyes open, expoſed themſelves to inevitable miſery, whether they ſhould ſucceed or fail in their enterpriſe; and that they concerted their meaſures ſo as not to admit of a poſſibility of recompence to themſelves, either in this life or in that which is to come. But if there be a law of nature, for the reality of which we have better evidence than we have for others, it is, that "no man can chooſe miſery for its *own ſake*," or make the acquiſion of it the ultimate end of his purſuit. The exiſtence of other laws of nature we know by teſtimony and our own obſervation of the regularity of their effects. The exiſtence of this law is made known to us not only by theſe means, but alſo by the ſtill clearer and more concluſive evidence of our own conſciouſneſs.

Thus, then do miracles force themſelves upon our aſſent in every poſſible view which we can take of this intereſting ſubject. If the teſtimony of the firſt preachers of Chriſtianity was true, the miracles recorded in the Goſpel were certainly performed, and the doctrines of our religion are derived from heaven. On the other hand, if that teſtimony was falſe, either God muſt have miraculouſly effaced from the minds of thoſe by whom it was given all the aſſociations formed between their ſenſible ideas and the words of language, or he muſt have endowed thoſe men with the gift of preſcience, and have impelled them to fabricate a pretended revelation for the purpoſe of deceiving the world, and involving themſelves in certain and foreſeen deſtruction.

The power neceſſary to perform the one ſeries of theſe miracles may, for any thing known to us, be as great as that which would be requiſite for the performance of the other; and conſidered merely as exertions of preternatural power, they may ſeem to balance each other, and to hold the mind in a ſtate of ſuſpence. But when we take into conſideration the different purpoſes for which theſe oppoſite and contending miracles were wrought, the balance is inſtantly deſtroyed. The miracles recorded in the Goſpels, if real, were wrought in ſupport of a revelation which, in the opinion of all by whom it is received, has brought to light many important truths which could not otherwiſe have been made known to men; and which, by the confeſſion of its adverſaries, contains the pureſt moral precepts by which the conduct of mankind was ever directed. The oppoſite ſeries of miracles, if real, was performed to enable, and even to compel, a company of Jews, of the loweſt rank and of the narroweſt education, to fabricate, with the view of inevitable deſtruction to themſelves, a conſiſtent ſcheme of falſehood, and by an appeal to forged miracles to impoſe it upon the world as a revelation from heaven. The object of the former miracles is worthy of a God of infinite wiſdom, goodneſs, and power. The object of the latter is abſolutely inconſiſtent with wiſdom and goodneſs, which are demonſtrably attributes of that Being by whom alone miracles can be performed. Whence it follows, that the ſuppoſition of the apoſtles bearing *falſe* teſtimony to the miracles of their Maſter, implies a ſeries of deviations from the laws of nature infinitely leſs probable in themſelves than thoſe miracles: and therefore, by Mr Hume's maxim, we muſt neceſſarily reject the ſuppoſition of falſehood in the teſtimony, and admit the reality of the miracles. So true is it, that for the reality of the Goſpel-miracles we have evidence as convincing to the reflecting mind, as thoſe had who were contemporary with Chriſt and his apoſtles, and were actual witneſſes to their mighty works.

MIRANDNA-de-Ebro, a town of Spain in Old Caſtile, with a ſtrong caſtle; ſeated in a country that produces excellent wine. The town is divided into two parts by the river, over which there is a handſome bridge. W. Long. 3. 10. N. Lat. 42. 52.

MIRADE, a town of Gaſcony in France, capital of the county of Aſtarac; ſeated on a mountain near the river Bauſe. E. Long. 0. 21. N. Lat. 42. 52.

MIRANDO-de-Douro or *Duro*, a ſtrong town of Portugal, and capital of the province of Tra-los-Montes, with a biſhop's ſee. It is well fortified, and ſeated on a rock near the confluence of the river Douro and Freſna. W. Long. 5. 40. N. Lat. 41. 30.

MIRANDOLA, a town of Italy, and capital of a duchy of the ſame name, ſituated between the duchies of Mantua and Modena. It is a pretty large place, well fortified, and has alſo a ſtrong citadel and fort. It has been ſeveral times taken and retaken; the laſt time by the king of Sardinia in 1742. E. Long. 11. 5. N. Lat. 44. 52.

MIRANDULA. See Picus.

MIREVELT (Michael Janſen), portrait-painter, was the ſon of a Goldſmith, and born at Delft in 1568. His father, perceiving his early inclination for the arts, placed him at firſt with one of the Wierixes, of whom he learned to draw in crayons and to engrave. At the age of twelve he executed a print of the Samaritan woman; and not long after a figure of Judith holding the head of Holofernes. Theſe juvenile performances attracted the notice of Anthony Blockland, an hiſtorical painter of great note; and under his inſtructions Mirevelt took up the pencil. He was very ſucceſsful in his attempts at painting hiſtory; but finding portraits to be more profitable, he quitted the former by degrees, and applied himſelf to portrait painting only. His reputation according to De Piles, was ſo great, that he exacted what price for his pictures he pleaſed, never taking leſs than 150 florins a piece. The portraits drawn and painted by this artiſt are exceedingly numerous; and many of them were excellently engraved by William James Delft, his near relation, a very ſkilful artiſt. He died in 1641.

Mirevelt (Peter), ſon of Michael, was born at Delft in 1596, and died in 1632. In his manner of deſign, in his ſtyle of colouring, and in the delicacy of his pencil, he exactly reſembled his father; and by the beſt judges of that time he was accounted to be in no degree inferior to him.

MIRIAM, ſiſter of Aaron and Moſes, makes two or three remarkable appearances in ſcripture. It was owing to her that her mother was employed by Pharaoh's daughter as nurſe to Moſes. She put herſelf at the head of the women of Iſrael after their paſſage through the Red Sea, in order to ſing the ſong which the men had ſung before. She joined with her brother Aaron in murmuring againſt Moſes, and was ſeverely chaſtiſed for that action; for ſhe became leprous, and continued ſeparate from the reſt without the camp for ſeven days. She died before her brothers, though in the ſame year with them, and was buried at the public expence.

MIRROR, a name for a looking glaſs, or any poliſhed body, whoſe uſe is to form the images of diſtant objects, by reflection of the rays of light. See Reflection

Mirrors are either plain, convex, or concave. The firſt reflect the rays of light in a direction exactly ſimilar to that in which they fall upon them, and therefore repreſent bodies of their natural magnitude. The convex ones make the rays diverge much more than before reflection, and therefore greatly diminiſh the images of thoſe objects which they ſhow: while the concave ones, by collecting the rays into a focus, not only magnify the objects they ſhow, but will burn very fiercely when expoſed to the rays of the ſun; and hence they are commonly known by the name of *burning mirrors*. See *Burning-Mirrors*.

In ancient times the mirrors were made of ſome kind of metal; and from a paſſage in the Moſaic writings we learn that the mirrors uſed by the Jewiſh women were made of braſs. The Jews certainly had been taught to uſe that kind of Mirrors by the Egyptians; from whence it is probable that brazen mirrors were the firſt kind uſed in the world. Any kind of metal, indeed, when well poliſhed, will reflect very powerfully, but of all others ſilver reflects the moſt, tho' it has been in all countries too expenſive a material for common uſe. Gold alſo is very powerful; and metals, or even wood, gilded and poliſhed, will act very powerfully as burning mirrors. Even poliſhed ivory, or ſtraw nicely plaited together, will form mirrors capable of burning, if on a large ſcale.

Since the invention of glaſs, and the application of quickſilver to it, became generally known, it hath been univerſally employed for thoſe plain mirrors uſed as ornaments to houſes; but in making reflecting teleſcopes, they have been found much inferior to metallic ones. It doth not appear that the ſame ſuperiority belongs to the metalline burning mirrors, conſidered merely as burning glaſſes; ſince the mirror with which Mr Macquer melted platina, though only 22 inches diameter, and which was made of quickſilvered glaſs, produced much greater effects than M. Villette's metalline ſpeculum, which conſiderably exceeded it in ſize. It is very probable, however, that this mirror of M. Villette's was by no means ſo well poliſhed as it ought to have been; as the art of preparing the metal for taking the fineſt poliſh has but lately been diſcovered and publiſhed in the Philoſophical Tranſactions

Mire-crow ‖ Miſchna.

tions by Mr Mudge. See *Glass Grinding*, and the *Mechanical Part* of Optics.

MIRE-CROW, sea-crow, or *Pewit*. See Larus.

MISADVENTURE, in common language, ſignifies any unlucky accident which takes place without being foreſeen.

Misadventure, in law, has an eſpecial ſignification for the killing a man partly by negligence, and partly by chance. See Homicide.

MISANTHROPY (formed μισος, *hatred*, and ανθρωπος, a *man*); a general diſlike or averſion to man, and mankind. In which ſenſe it ſtands oppoſed to *philanthropy*, or the love of mankind.

MISCARRIAGE. See Abortion and Midwifery.

MISCHNA, or Misna, (from שנה, *iteravit*), a part of the Jewiſh Talmud.

The Miſchna contains the text; and the Gemara, which is the ſecond part of the Talmud, contains the commentaries: ſo that the Gemara is, as it were, a gloſſary on the Miſchna.

The Miſchna conſiſts of various traditions of the Jews, and of explanations of ſeveral paſſages of ſcripture: theſe traditions ſerving as an explication of the written law, and ſupplement to it, are ſaid to have been delivered to Moſes during the time of his abode on the Mount; which he afterwards communicated to Aaron, Eleazar, and his ſervant Joſhua. By theſe they were tranſmitted to the 70 elders, by them to the prophets, who communicated them to the men of the great ſanhedrim, from whom the wiſe men of Jeruſalem and Babylon received them. According to Prideaux's account, they paſſed from Jeremiah to Baruch, from him to Ezra, and from Ezra to the men of the great ſynagogue, the laſt of whom was Simon the Juſt; who delivered them to Antigonus of Socho: and from him they came down in regular ſucceſſion to Simeon, who took our Saviour in his arms; to Gamuliel, at whoſe feet Paul was educated; and laſt of all to Rabbi Judah the Holy, who committed them to writing in the Miſchna. But Dr Prideaux, rejecting this Jewiſh fiction, obſerves, that after the death of Simon the Juſt, about 299 years before Chriſt, the Miſchnical doctors aroſe, who, by their comments and concluſions, added to the number of thoſe traditions which had been received and allowed by Ezra and the men of the great ſynagogue; ſo that towards the middle of the ſecond century after Chriſt, under the empire of Antoninus Pius, it was found neceſſary to commit theſe traditions to writing; more eſpecially, as their country had conſiderably ſuffered under Adrian, and many of their ſchools had been diſſolved, and their learned men cut off; and therefore the uſual method of preſerving their traditions had failed. Rabbi Judah on this occaſion being rector of the ſchool at Tiberias, and preſident of the ſanhedrim in that place, undertook the work, and compiled it in ſix books, each conſiſting of ſeveral tracts, which altogether make up the number of 63. *Prid. Connect.* vol. ii. p. 468, &c. ed. 9. This learned author computes, that the Miſchna was compoſed about the 150th year of our Lord; but Dr Lightfoot ſays, that Rabbi Judah compiled the Miſchna about the year of Chriſt 190, in the latter end of the reign of Commodus; or, as ſome compute, in the year of Chriſt 220. Dr Lardner is of opinion, that this work could not have been compoſed before the year 190, or later. Collect. of Jewiſh and Heathen Teſtimonies, &c. vol. i. p. 178. Thus the book called the *Miſchna* was formed; a book which the Jews have generally received with the greateſt veneration. The original has been publiſhed with a Latin tranſlation by Surenhuſius, with notes of his own, and others from the learned Maimonides, &c. in 6 vols. fol. Amſterd. A. D. 1698—1703. (See Talmud). It is written in a much purer ſtyle, and is not near ſo full of dreams and viſions as the Gemara.

Miſchna ‖ Miſenum.

MISDEMEANOUR, in law, ſignifies a crime. Every crime is a miſdemeanour; yet the law has made a diſtinction between crimes of an higher and a lower nature; the latter being denominated *miſdemeanours*, the former *felonies*, &c. For the underſtanding of which diſtinction, we ſhall give the following definition from Blackſtone's Commentaries, vol. iv. 5.

"A crime, or miſdemeanour, is an act *committed* or *omitted*, in violation of a public law, either forbidding or commanding it. This general definition comprehends both *crimes* and *miſdemeanours*; which, properly ſpeaking, are mere ſynonymous terms; though, in common uſage, the word *crime* is made to denote ſuch offences as are of a deeper and more atrocious dye; while ſmaller faults, and omiſſions of leſs conſequence, are compriſed under the gentler name of *miſdemeanours* only."

MISE, in law-books, is uſed in various ſenſes: thus it ſometimes ſignifies coſts or expences; in which ſenſe it is commonly uſed in entering of judgments in actions perſonal. It is alſo uſed for the iſſue to be tried on the grand aſſize; in which caſe, joining of the miſe upon the mere right, is putting an iſſue between the tenant and demandant, Who has the beſt or cleareſt right.

Mise alſo ſignifies a tax or tallage, &c. An honorary gift, or cuſtomary preſent from the people of Wales to every new king or prince of Wales, anciently given in cattle, wine, and corn, but now in money, being 5000 l. or more, is denominated a *miſe*: ſo was the uſual tribute or fine of 3000 merks paid by the inhabitants of the county palatine of Cheſter at the change of every owner of the ſaid earldoms, for enjoying their liberties. And at Cheſter they have a miſe-book, wherein every town and village in the county is rated what to pay towards the miſe. The 27 Hen. VIII. c. 26. ordains that lords ſhall have all ſuch miſes and profits of their lands as they had in times paſt, &c.

Mise, is ſometimes alſo corruptly uſed for *meaſe*, in law French *mees*, "a meſſuage;" as a *miſe place*, in ſome manors, is ſuch a meſſuage or tenement as anſwers the lord a heriot at the death of its owner. 2. *Inſt.* 528.

MISENUM, or Misenus, (anc. geog.); a promontory, port, and town in Campania, ſituated to the ſouth weſt of Baiæ, in the Sinus Puteolanus, on the north ſide. Here Auguſtus had a fleet, called *Claſſis Miſenenſis*, for guarding the Mare Inferum; as he had another at Ravenna for the Superum.

On this peninſula a villa was built by Caius Marius, with a degree of elegance that gave great offence to the more auſtere among the Romans, who thought and ſuited to the character of ſo rich a ſybarite. Upon the ſite of Marius's villa Lucullus, the plunderer of the eaſtern world, erected an edifice, in compariſon of which the former houſe was a cottage; but even his magnificence was eclipſed by the ſplendour of the palace which the emperors [illegible]. Of all the ſplendid abodes of heroes and emperors, which have long been levelled to the ground, a few fiſhing huts, as Mr Swinburne informs us, and a lonely public houſe, have ſucceeded; hither boatmen reſort to tipple, perhaps on the identical ſite where the voluptuous maſters of the world quaffed Chian and Falernian wines.

MISER, a parſimonious perſon who is at the ſame time rich; or a wretch covetous to extremity, whom avarice has diveſted of all the charities of human nature, and made even an enemy to himſelf.

Of this moſt unaccountable of all characters, many inſtances occur; ſome of them ſo extraordinary as almoſt to ſurpaſs belief. The following are here ſelected, as being of recent date, perfectly authentic, and the laſt of them in particular exhibiting an aſſemblage of qualities the moſt ſingular perhaps that ever centered in the ſame perſon. Too little dignified to merit a place in regular biography, yet too curious a variety of human character to paſs unnoticed in this Work, the preſent ſeemed the only title under which it could with propriety be introduced.

1. In December 1790, died at Paris, literally of want, Mr Oſtervald, a well-known banker. This man, originally of Neufchatel, felt the violence of the diſeaſe of avarice (for ſurely it is rather a diſeaſe than a paſſion of the mind) ſo ſtrongly, that, within a few days of his death, no importunities could induce him to buy a few pounds of meat for the purpoſe of making a little ſoup for him. "'Tis true (ſaid he), I ſhould not diſlike the ſoup, but I have no appetite for the meat: what then is to become of that?" At the time that he refuſed this nouriſhment, for fear of being obliged to give away two or three pounds of meat, there was tied round his neck a ſilken bag, which contained 800 aſſignats of 1000 livres each. At his outſet in life, he drank a pint of beer, which ſerved him for ſupper, every night at a houſe much frequented, from which he carried home all the bottle-corks he could come at. Of theſe, in the courſe of eight years, he had collected as many as ſold for 12 louis d'ors, a ſum that laid the foundation of his future fortune, the ſuperſtructure of which was rapidly raiſed by his uncommon ſucceſs in ſtock-jobbing. He died poſſeſſed of three millions of livres (L. 125,000 ſterling.)

2. The late John Elwes, Eſq; was member for Berkſhire in three ſucceſſive parliaments. His family name was *Meggot*: and his father was a brewer of great eminence, and diſtinguiſhed by no peculiarity of character: but his mother, though ſhe was left nearly L. 100,000 by her huſband, ſtarved herſelf to death! At an early period of life he was ſent to Weſtminſter ſchool, where he remained for 10 or 12 years. During that time he certainly had not miſapplied his talents; for he was a good claſſical ſcholar to the laſt: and it is a circumſtance not a little remarkable, though well authenticated, that he never read afterwards, nor had he ever any knowledge in accounts; to which may in ſome meaſure be attributed the total ignorance he always was in, as to his affairs. From Weſtminſter ſchool Mr Meggot removed to Geneva, where he ſoon entered upon purſuits more agreeable to him than ſtudy. The riding-maſter of the academy there had then to boaſt perhaps of three of the beſt riders in Europe, Mr Worſley, Mr Elwes, and Sir Sidney Meadows. Of the three, Elwes was reckoned the moſt deſperate; the young horſes were always put into his hands, and he was the rough rider to the other two.

On his return to England, after an abſence of two or three years, he was to be introduced to his uncle the late Sir Harvey Elwes, who was then living at Stoke in Suffolk, perhaps the moſt perfect picture of human penury that ever exiſted. The attempts at ſaving money were in him ſo extraordinary, that Mr Elwes perhaps never quite reached them, even at the laſt period of his life.—Of what temperance can do, Sir Harvey was an inſtance. At an early period of life he was given over for a conſumption, and he lived till betwixt 80 and 90 years of age. On his death, his fortune, which was at leaſt L. 250,000, fell to his nephew Mr Meggot, who by will was ordered to aſſume the name and arms of Elwes. To this uncle, and this property, Mr Elwes ſucceeded when he had advanced beyond the 40th year of his age. And for 15 years previous to this period, it was that he was known in the more faſhionable circles of London. He had always a turn for play; and it was only late in life; and from paying always and not always being paid, that he conceived diſguſt at it. The theory which he profeſſed, "that it was impoſſible to aſk a gentleman for money," he perfectly confirmed by the practice; and he never violated this feeling to the lateſt hour of his life.

The manners of Mr Elwes were ſuch—ſo gentle, ſo attentive, ſo gentlemanly, and ſo engaging—that rudeneſs could not ruffle them, nor ſtrong ingratitude break their obſervance. He retained this peculiar feature of the old court to the laſt: but he had a praiſe beyond this; he had the moſt gallant diſregard of his own perſon, and all care about himſelf, that can be imagined. The inſtances in younger life, in the moſt imminent perſonal hazard, are innumerable; but when age had diſpoiled him of his activity, and might have rendered care and attention about himſelf natural, he knew not what they were: He wiſhed no one to aſſiſt him: "He was as young as ever; he could walk; he could ride, and he could dance; and he hoped he ſhould not give trouble even when he was old:" He was at that time 75.

It is curious to remark how he contrived to mingle ſmall attempts at ſaving with objects of the moſt unbounded diſſipation. After ſitting up a whole night at play for thouſands with the moſt faſhionable and profligate men of the time, amidſt ſplendid rooms, gilt ſofas, wax lights, and waiters attendant on his call, he would walk out about four in the morning, not towards home, but into Smithfield, to meet his own cattle, which were coming to market from Thaydon-hall, a farm of his in Eſſex! There would this ſame man, forgetful of the ſcenes he had juſt left, ſtand in the cold and rain bartering with a carcaſs-butcher for a ſhilling! Sometimes, when the cattle did not arrive at the hour he expected, he would walk on in the mire to meet them; and more than once has gone on foot the whole way to his farm without ſtopping, which was 17 miles from London, after ſitting up the whole night. Had every man been of the mind of Mr Elwes, the race of innkeepers muſt have periſhed, and poſt-chaiſes have been returned back to thoſe who made them; for it was the buſineſs of his life to avoid both. He always travelled on horſeback. To ſee him ſetting out on a journey, was a matter truly curious; his firſt care was to put two or three eggs, boiled hard, into his great-coat pocket, or any ſcraps of bread which he found; baggage he never took: then mounting one of his hunters, his next attention was to get out of London into that road where turnpikes were the feweſt: then, ſtopping under any hedge where graſs preſented itſelf for his horſe, and a little water for himſelf, he would ſit down and refreſh himſelf and his horſe together.

The chief reſidence of Mr Elwes at this period of his life was in Berkſhire, at his own ſeat at Marcham. Here it was he had two natural ſons born, who inherit the greateſt part of his property by a will made about the year 1785. The keeping fox-hounds was the only inſtance in the whole life of Mr Elwes of his ever ſacrificing money to pleaſure; and may be ſelected as the only period when he forgot the cares, the perplexities, and the regret, which his wealth occaſioned. But even here every thing was done in the moſt frugal manner. Scrub, in the Beaux Stratagem, when compared with Mr Elwes's huntſman had an idle life of it. This famous huntſman might have fixed an epoch in the hiſtory of ſervants: for in a morning, getting up at four o'clock, he milked the cows; he then prepared breakfaſt for Mr Elwes or any friends he might have with him: then ſlipping on a green coat, he hurried into the ſtable, ſaddled the horſes, got the hounds out of the kennel, and away they went into the field. After the fatigues of hunting, he refreſhed himſelf by rubbing down two or three horſes as quickly as he could; then running into the houſe to lay the cloth, and wait at dinner; then hurrying again into the ſtable to feed the horſes—diverſified with an interlude of the cows again to milk, the dogs to feed, and eight hunters to litter down for the night.

In the penury of Mr Elwes there was ſomething that ſeemed like a judgment from heaven. All earthly comforts he voluntarily denied himſelf: he would walk home in the rain in London rather than pay a ſhilling for a coach; he would ſit in wet cloaths ſooner than have a fire to dry them; he would eat his proviſions in the laſt ſtage of putrefaction ſooner than have a freſh joint from the butchers; and he wore a wig for above a fortnight, which his biographer * ſaw him pick up out of a rut in a lane where they were riding. This was the laſt extremity of laudable œconomy; for to all appearance it was the caſt-off wig of ſome beggar!

Mr Elwes had now reſided about 13 years in Suffolk, when the conteſt for Berkſhire preſented itſelf on the diſſolution of the parliament; and when, to preſerve the peace of that county, he was nominated by Lord Craven. Mr Elwes, though he had retired from public buſineſs for ſome years, had ſtill left about him ſome of the ſeeds of more active life, and he agreed to the propoſal. It came farther enhanced to him, by the agreement, that he was to be brought in by the freeholders for nothing. All he did on the occaſion was dining at the ordinary at Reading; and he got into parliament for 18 pence!

Though a new man, Mr Elwes could not be called a young member; for he was at this time nearly 60 years old when he thus entered on public life. But he was in poſſeſſion of all his activity; and preparatory to his appearance on the boards of St Stephen's Chapel, he uſed to attend conſtantly during the races and other public meetings all the great towns where his voters reſided. At the different aſſemblies, he would dance amongſt the youngeſt to the laſt, after riding over on horſeback, and frequently in the rain, to the place of meeting. A gentleman who was one night ſtanding by, obſerved on the extraordinary agility of ſo old a man.—"O! that is nothing (replied another); for Mr Elwes, to do this, rode 20 miles in the rain, with his ſhoes ſtuck into his boots and his bag-wig in his pocket."

The honour of parliament made no alteration in the dreſs of Mr Elwes: on the contrary, it ſeemed at this time to have attained additional meanneſs; and nearly to have reached that happy climax of poverty, which has more than once drawn on him the compaſſion of thoſe who paſſed by him in the ſtreet. For the ſpeaker's dinners, however, he had one ſuit, with which the ſpeaker in the courſe of the ſeſſions became very familiar. The miniſter likewiſe was well acquainted with it; and at any dinner of oppoſition ſtill was his apparel the ſame. The wits of the minority uſed to ſay, "that they had full as much reaſon as the miniſter to be ſatisfied with Mr Elwes, as he had the ſame habit with every body" At this period of his life Mr Elwes wore a wig. Much about the time when his parliamentary life ceaſed, that wig was worn out; ſo then, being older and wiſer as to expence, he wore his own hair, which like his expences was very ſmall.

All this time the income of Mr Elwes was increaſing hourly, and his preſent expenditure was next to nothing; for the little pleaſures he had once engaged in he had now given up. He kept no houſe, and only one old ſervant and a couple of horſes: he reſided with his nephew: his two ſons he had ſtationed in Suffolk and Berkſhire, to look after his reſpective eſtates: and his dreſs certainly was no expence to him; for had not other people been more careful than himſelf, he would not have had it even mended.

When he left London, he went on horſeback to his country-ſeats with his couple of hard eggs, and without once ſtopping upon the road at any houſe. He always took the moſt unfrequented road, and uſed every ſhift to avoid turnpikes. Marcham was the ſeat he now chiefly viſited; which had ſome reaſon to be flattered with the preference, as his journey into Suffolk coſt him only two-pence half-penny, while that into Berkſhire amounted to four-pence!

As Mr Elwes came into parliament without expence, he performed his duty as a member would have done in the pure days of our conſtitution. What he had not bought, he never attempted to ſell; and he went forward in that ſtraight and direct path, which can alone ſatisfy a reflecting mind. Amongſt the ſmaller memorials of the parliamentary life of Mr Elwes may be noted, that he did not follow the cuſtom

* Mr Topham; from whoſe Life of John Elwes, Eſq; the particulars of this article are extracted.

Miser.

from or members in general, by ſitting on any particular ſide of the houſe, but ſat as occaſion preſented itſelf on either indiſcriminately; and he voted much in the ſame manner, but never roſe to ſpeak. In his attendance at the houſe, he was always early and late; and he never left it for dinner, as he had accuſtomed himſelf to faſting, ſometimes for 24 hours in continuance.

When he quitted parliament, he was, in the common phraſe, "a fiſh out of water!" The ſtyle of Mr Elwes's life had left him no domeſtic ſcenes to which he could retire—his home was dreary and poor—his rooms received no cheerfulneſs from fire; and while the outſide had all the appearance of a "Houſe to be Let," the inſide was a deſert; but he had his penury alone to thank for this, and for the want of all the little conſolations which ſhould attend old age, and ſmooth the paſſage of declining life. At the cloſe of the ſpring 1785, he wiſhed again to viſit, which he had not done for ſome years, his ſeat at Stoke. But then the journey was a moſt ſerious object to him. The famous old ſervant was dead; all the horſes that remained with him were a couple of worn-out brood-mares; and he himſelf was not in that vigour of body in which he could ride 60 or 70 miles on the ſuſtenance of *two boiled eggs*. The mention of a poſt-chaiſe would have been a crime—"He afford a poſt-chaiſe, indeed! where was he to get the money?" would have been his exclamation. At length he was carried into the country as he was carried into parliament, free of expence, by a gentleman who was certainly not quite ſo rich as Mr Elwes. When he reached Stoke—the ſeat of more active ſcenes, of ſomewhat reſembling hoſpitality, and where his fox-hounds had ſpread ſomewhat like vivacity around,—he remarked, "he had expended a great deal of money once very fooliſhly; but that a man grew wiſer by time."

The rooms at this ſeat, which were now much out of repair, and would have all fallen in but for his ſon John Elwes, Eſq; who had reſided there, he thought too expenſively furniſhed, as worſe things might have ſerved. If a window was broken, there was to be no repair but that of a little brown paper, or that of piecing in a bit of broken glaſs; which had at length been done ſo frequently, and in ſo many ſhapes, that it would have puzzled a mathematician to ſay "what figure they deſcribed." To ſave fire, he would walk about the remains of an old greenhouſe, or ſit with a ſervant in the kitchen. During the harveſt he would amuſe himſelf with going into the fields to glean the corn on the grounds of his own tenants; and they uſed to leave a little more than common to pleaſe the old gentleman, who was as eager after it as any pauper in the pariſh. In the advance of the ſeaſon, his morning employment was to pick up any ſtray chips, bones, or other things, to carry to the fire, in his pocket—and he was one day ſurpriſed by a neighbouring gentleman in the act of pulling down, with ſome difficulty, a crow's neſt for this purpoſe. On the gentleman wondering why he gave himſelf this trouble—"Oh, Sir, (replied old Elwes), it is really a ſhame that theſe creatures ſhould do ſo. Do but ſee what waſte they make! They don't care how extravagant they are!"

As no gleam of favourite paſſion, or any ray of amuſement, broke through this gloom of penury, his inſatiable deſire of ſaving was now become uniform and ſyſtematic. He uſed ſtill to ride about the country on one of theſe mares—but then he rode her very economically, on the ſoft turf, adjoining the road, without putting himſelf to the expence of ſhoes, as he obſerved, "The turf was ſo pleaſant to a horſe's foot!" And when any gentleman called to pay him a viſit, and the boy who attended in the ſtables was profuſe enough to put a little hay before his horſe, old Elwes would ſlily ſteal back into the ſtable, and take the hay very carefully away. That very ſtrong appetite which Mr Elwes had in ſome meaſure reſtrained during the long ſitting of parliament, he now indulged moſt voraciouſly, and on every thing he could find. To ſave, as he thought, the expence of going to a butcher, he would have a whole ſheep killed, and ſo eat mutton to the—*end of the chapter*. When he occaſionally had his river drawn, though ſometimes horſe-loads of ſmall fiſh were taken, not one would he ſuffer to be thrown in again; for he obſerved, "He ſhould never ſee them again!" Game in the laſt ſtate of putrefaction, and meat that *walked about his plate*, would he continue to eat, rather than have new things killed before the old proviſion was finiſhed. With this diet—the *charnel-houſe of ſuſtenance*—his dreſs kept pace—equally in the laſt ſtage of *abſolute diſſolution*. Sometimes he would walk about in a tattered brown-coloured hat, and ſometimes in a red and white woollen cap, like a priſoner confined for debt. His ſhoes he never would ſuffer to be cleaned, leſt they ſhould be worn out the ſooner. But ſtill, with all this *ſelf-denial*—that penury of life to which the inhabitant of an *alms-houſe* is not doomed—ſtill did he think he was profuſe, and frequently ſay, "He muſt be a little more careful of his property." His diſquietude on the ſubject of money was now continual. When he went to bed, he would put five or ten guineas into a bureau; and then, full of his money, after he had retired to reſt, and ſometimes in the middle of the night, he would come down to ſee if it was there.

The ſcene of mortification at which Mr Elwes was now arrived was all but a denial of the common neceſſaries of life: and indeed it might have admitted a doubt, whether or not, if his manors, his fiſh-ponds, and ſome grounds in his own hands, had not furniſhed a ſubſiſtence, where he had not any thing *actually to buy*, he would not, rather than have *bought any thing*, have ſtarved. Strange as this may appear, it is not exaggerated.—He one day, during this period, dined upon the remaining part of a moor-hen, which had been brought out of the river by a *rat!* and at another eat an undigeſted part of a pike which a larger one had ſwallowed, but had not finiſhed, and which were taken in this ſtate in a net. At the time this laſt circumſtance happened, he diſcovered a ſtrange kind of ſatisfaction; for he ſaid to a friend, "Aye! this was killing two birds with one ſtone!" In the room of all comment—of all moral—let it be remarked, that at this time Mr Elwes was perhaps worth nearly *eight hundred thouſand pounds!* and, at this period, he had not made his will, of courſe was not ſaving from any ſentiment of affection for any perſon.

The ſummer of 1788 Mr Elwes paſſed at his houſe in Welbeck-ſtreet, London; and he paſſed that ſummer without any other ſociety than that of two maid-ſervants; for he had now given up the expence of keeping any male domeſtic. His chief employment uſed to be that of getting up early in a morning to viſit ſome of his houſes in Mary-le-Bone, which during the ſummer were repairing. As he was there generally at four o'clock in a morning, he was of courſe on the ſpot before the workmen; and he uſed contentedly to ſit down on the ſteps before the door, to ſcold them when they did come. The neighbours who uſed to ſee him appear thus regular every morning, and who concluded, from his apparel, he was one of the workmen, obſerved, "there never was ſo punctual a man as the old carpenter." During the whole morning he would continue to run up and down ſtairs to ſee the men were not idle for an inſtant, with the ſame anxiety as if his whole happineſs in life had been centered in the finiſhing this houſe, regardleſs of the greater property he had at ſtake in various places, and for ever employed in the *minutiæ* only of affairs. Indeed ſuch was his anxiety about this houſe, the rent of which was not above L. 50 a-year that it brought on a fever which nearly coſt him his life: but the fate which dragged him on thus ſtrangely to bury him under the load of his own wealth, ſeemed as reſiſtleſs as it was unaccountable.

In the muſcular and unencumbered frame of Mr Elwes there was every thing that promiſed extreme length of life; and he lived to above 70 years of age without any natural diſorder attacking him: but, as Lord Bacon has well obſerved, "the minds of ſome men are a lamp that is continually burning;" and ſuch was the mind of Mr Elwes. Removed from thoſe occaſional public avocations which had once engaged his attention, money was now his only thought. He roſe upon money—upon money he lay down to reſt; and as his capacity ſunk away from him by degrees, he dwindled from the real cares of his property into the puerile concealment of a few guineas. This little ſtore he would carefully wrap up in various papers, and depoſiting them in different corners, would amuſe himſelf with running from one to the other, to ſee whether they were all ſafe. Then forgetting, perhaps, where he had concealed ſome of them, he would become as ſeriouſly afflicted as a man might be who had loſt all his property. Nor was the day alone thus ſpent—he would frequently riſe in the middle of the night, and be heard walking about different parts of the houſe, looking after what he had thus hidden and forgotten.

During the winter of 1789, the laſt winter Mr Elwas was fated to ſee, his memory viſibly weakened every day; and from the unceaſing wiſh to ſave money he now began to fear he ſhould die in want of it. Mr Gibſon had been appointed his builder in the room of Mr Adams; and one day, when this gentleman waited upon him, he ſaid with apparent concern, "Sir, pray conſider in what a wretched ſtate I am; you ſee in what a good houſe I am living; and here are five guineas, which is all I have at preſent; and how I ſhall go on with ſuch a ſum of money puzzles me to death. I dare ſay you thought I was rich; now you ſee how it is!"

Mr George Elwes having now ſettled at his ſeat at Marcham in Berkſhire, he was naturally deſirous that in the aſſiduities of his wife, his father might at length find a comfortable [illegible] ly moſt uncomfortable: but this, with the [illegible] tions before and behind him, a journey, with any expence annexed to it was inſurmountable. This, however, was luckily obviated by an offer from Mr Partis, a gentleman of the law, to take him to his [illegible] ſeat in Berkſhire with his purſe perfectly whole. But there was one circumſtance ſtill very diſtreſsing—the old gentleman had now nearly worn out his laſt coat, and he would not buy a new one; his ſon, therefore, with a pious fraud, contrived to get Mr Partis to buy him a coat and make him a preſent of it. Thus, formerly having had a good coat, then a bad one, and at laſt no coat at all, he was kind enough to accept one from a neighbour.

Mr Elwes carried with him into Berkſhire five guineans and a half, and a half crown. Leſt the mention of this ſum may appear ſingular, it ſhould be ſaid; that previous to his journey he had carefully wrapped it up in various folds of paper, that no part of it might be loſt. On the arrival of the old gentleman, Mr George Elwes and his wife did every thing they could to make the country a ſcene of quiet to him. But "he had that within" which baffled every effort of this kind. Of his heart it might be ſaid, "there was no peace in Iſrael." His mind, caſt away upon the vaſt and troubled ocean of his property extending beyond the bounds of his calculation, returned to amuſe itſelf with fetching and carrying about a few guineas, which in that ocean was indeed a drop. But nature had now carried on life nearly as far as ſhe was able, and the ſand was almoſt run out. The firſt ſymptoms of more immediate decay was his inability to enjoy his reſt at night. Frequently would he be heard at midnight as if ſtruggling with ſome one in his chamber, and crying out, "I will keep my money, I will; nobody ſhall rob me of my property." On any one of the family going into his room, he would ſtart from this fever of anxiety, and, as if waking from a troubled dream again hurry into bed, and ſeem unconſcious of what had happened. At length, on the 26th of November 1789, expired this miſerably rich man, whoſe property, nearly reaching to a million, extended itſelf almoſt through every county in England.

MISERICORDIA, in law, is an arbitrary fine impoſed on any perſon for an offence: this is called *miſericordia*, becauſe the amercement ought to be but ſmall, and leſs than that required by magna charta. If a perſon be outrageouſly amerced in a court that is not of record, the writ called *moderata miſericordia* lies for moderating the amercement according to the nature of the fault.

MISFORTUNE. An unlucky accident.

Misfortune, or chance, in law, a deficiency of the will; or committing of an unlawful act by misfortune or chance, and not by deſign. In ſuch caſe, the will obſerves a total neutrality, and does not co-operate with the deed; which therefore wants one main ingredient of a crime. See Crime.

Of this, when it affects the life of another, we have ſpoken under the article Homicide; and in this place have only occaſion to obſerve, that if any accidental miſchief happens to follow from the performance of a lawful act, the party ſtands excuſed from all guilt:

but if a man be doing any thing unlawful, and a conſequence enſues which he did not foreſee or intend, as the death of a man or the like, his want of foreſight ſhall be no excuſe; for being guilty of one offence, in doing antecedently what is in itſelf unlawful, he is criminally guilty of whatever conſequence may follow the firſt miſbehaviour.

MISFEASANCE, in law-books, ſignifies a treſpaſs.

MISLETOE, in botany. See Viscum.

MISNOMER, in law, a miſnaming or miſtaking a perſon's name. The Chriſtian name of a perſon ſhould always be perfect; but the law is not ſo ſtrict in regard to ſurnames, a ſmall miſtake in which will be diſpenſed with to make good a contract, and ſupport the act of the party. See Plea *to indictment*.

MISPRISIONS, (a term derived from the old French, *meſpris*, a neglect or contempt) are, in the acceptation of the law, generally underſtood to be all ſuch high offences as are under the degree of capital, but nearly bordering thereon: and it is ſaid, that a miſpriſion is contained in every treaſon and felony whatſoever; and that, if the king ſo pleaſe, the offender may be proceeded againſt for the miſpriſion only. And upon the ſame principle, while the juriſdiction of the ſtar-chamber ſubſiſted, it was held that the king might remit a proſecution for treaſon, and cauſe the delinquent to be cenſured in that court, merely for a high-miſdemeanour: as happened in the caſe of Roger earl of Rutland, in 43 Eliz. who was concerned in the earl of Eſſex's rebellion. Miſpriſions are generally divided into two ſorts; negative, which conſiſt in the concealment of ſomething which ought to be revealed; and poſitive, which conſiſt in the commiſſion of ſomething which ought not to be done.

1. Of the firſt, or negative kind, is what is called *miſpriſion of treaſon*; conſiſting in the bare knowledge and concealment of treaſon, without any degree of aſſent thereto: for any aſſent makes the party a principal traitor; as indeed the concealment, which was conſtrued aiding and abetting, did at the common law; in like manner as the knowledge of a plot againſt the ſtate, and not revealing it, was a capital crime at Florence, and other ſtates of Italy. But it is now enacted by the ſtatute 1 & 2 Ph. & Mar. c. 10. that a bare concealment of treaſon ſhall be only held a miſpriſion. This concealment becomes criminal, if the party apprized of the treaſon does not, as ſoon as conveniently may be, reveal it to ſome judge of aſſize or juſtice of the peace. But if there be any probable circumſtances of aſſent, as if one goes to a treaſonable meeting, knowing beforehand that a conſpiracy is intended againſt the king; or, being in ſuch company once by accident, and having heard ſuch treaſonable conſpiracy, meets the ſame company again, and hears more of it, but conceals it; this is an implied aſſent in law, and makes the concealer guilty of actual high-treaſon.

Miſpriſion of felony is alſo the concealment of a felony which a man knows, but never aſſented to: for, if he aſſented, this makes him either principal or acceſſory. And the puniſhment of this, in a public officer, by the ſtatute Weſtm. 1. 3 Edw. I. c. 9. is impriſonment for a year and a day; in a common perſon, impriſonment for a leſs diſcretionary time; and, in both, fine and ranſom at the king's pleaſure: which pleaſure of the king muſt be obſerved, once for all, not to ſignify any extrajudical will of the ſovereign, but ſuch as is declared by his repreſentatives, the judges in his courts of juſtice; *voluntas regis in curia, non in camera*.

2. Miſpriſions, which are merely poſitive, are generally denominated *contempt* or *high miſdemeanours*; of which the principal is the *mal-adminiſtration* of ſuch high officers as are in public truſt and employment. This is uſually puniſhed by the method of parliamentary impeachment; wherein ſuch penalties, ſhort of death, are inflicted, as to the wiſdom of the houſe of peers ſhall ſeem proper; conſiſting uſually of baniſhment, impriſonment, fines, or perpetual diſability. Hither alſo may be referred the offence of *embezzling the public money*, called among the Romans *peculatus*; which the Julian law puniſhed with death in a magiſtrate, and with deportation, or baniſhment, in a private perſon. In England it is not a capital crime, but ſubjects the committer of it to a diſcretionary fine and impriſonment.—Other miſpriſions are, in general, ſuch contempts of the executive magiſtrate as demonſtrate themſelves by ſome arrogant and undutiful behaviour towards the king and government: for a detail of which, *vide* Blackſtone's Comment. iv. 22.

MISSAL, the Romiſh maſs-book, containing the ſeveral maſſes to be ſaid on particular days. It is derived from the Latin word *miſſa*, which, in the ancient Chriſtian church, ſignified every part of divine ſervice.

MISSEL-bird, a ſpecies of Turdus.

MISSIO, among the Romans, was a full diſcharge given to a ſoldier after 20 years ſervice, and differed from the *exauctoratio*, which was a diſcharge from duty after 17 years ſervice. Every ſoldier had a right to claim his *miſſio* at the end of 20 years.

MISSION, in theology, denotes a power or commiſſion to preach the goſpel. Jeſus Chriſt gave his diſciples their miſſion in theſe words *Go and teach all nations*, &c.

The Romaniſts reproach the proteſtants, that their miniſters have no miſſion, as not being authoriſed in the exerciſe of their miniſtry, either by an uninterrupted ſucceſſion from the apoſtles, or by miracles, or by an extraordinary proof of a vocation.

There are many who deny any other miſſion neceſſary for the miniſtry than the talents neceſſary to diſcharge it.

Mission is alſo uſed for an eſtabliſhment of people zealous for the glory of God and the ſalvation of ſouls; who go and preach the goſpel in remote countries and among infidels.

There are miſſions in the Eaſt as well as in the Weſt Indies. Among the Romaniſts, the religious orders of St Dominic, St Francis, St Auguſtine, and the Jeſuits, have miſſions in the Levant, America, &c. The Jeſuits have alſo miſſions in China, and all other parts of the globe where they have been able to penetrate. There have been alſo ſeveral Proteſtant miſſions for diffuſing the light of Chriſtianity through the benighted regions of Aſia and America. Of this kind has been the Daniſh miſſion planned by Frederic IV. in 1706. And the liberality of private benefactors in other countries has been alſo extended to the ſupport of miſſionaries among the Indians in America, &c.

MISSIONARY, an eccleſiaſtic who devotes himſelf and his labours to ſome miſſion, either for the inſtruction of the orthodox, the conviction of heretics, or the converſion of infidels. See Jesuits.

MISSISIPPI, alſo called the *river of St Louis*, in North America, is one of the largeſt in the world. Its ſource is unknown. It paſſes ſouth through Louiſiana, and runs above 2000 miles, till it falls into the gulph of Florida. Like the Nile, it has periodical inundations, by the melting of ſnow in the north, ſo that in May it overflows the country on each ſide, from 60 to 90 miles, and the inundation continues till near the end of July. In the loweſt parts of the country there are moraſſes, lakes, and canals, along the banks, which are generally covered with trees, and in ſome places the courſe of the river is confined between high precipices. Its inundations always leave a great quantity of mud upon the land, and ſometimes carry down trees to the river's mouth, where they form new iſlands, and render the entrance difficult.

MISSON (Francis Maximilian), whoſe pleadings before the parliament of Paris in favour of the reformers bear genuine marks of eloquence and ability, retired into England after the revocation of the edict of Nantz, and became a ſtrenuous aſſertor of the Proteſtant religion. In the years 1687 and 1688 he travelled to Italy as governor to an Engliſh nobleman: in conſequence of which he publiſhed at the Hague, "A new voyage to Italy," 3 vols. 12mo. which have been tranſlated into Engliſh with many additions. He publiſhed alſo the "Sacred Theatre at Cevennes, or an account of Prophecies and Miracles performed in that part of Languedoc," London 1707. "Obſervations and Remarks of a Traveller," 12mo, Hague. He died at London in 1721.

MISSUS, in the Circenſian games, were the matches in horſe or chariot races. The uſual number of *miſſus* or matches in one day was 24; though the emperor Domitian preſented the people with 100. The laſt match was generally made at the expence of the people, who made a collection for the purpoſe; hence it was called *miſſus ærarius*, a ſubſcription plate.

MIST, or Fog. See Fog.

MISTAKE, any wrong action committed, not thro' an evil deſign, but through an error of judgment.

Mistake, in Law. See Ignorance.

MISUSER, in law, is an abuſe of any liberty or benefit; as "He ſhall make fine for his misuser." Old. Nat. Br. 149. By miſuſer a charter of a corporation may be forfeited; ſo alſo an office, &c.

MISY, in natural hiſtory, a ſpecies of the chalcantha, a foſſile very common in the Turkiſh dominions, and ſometimes found in the mines of Cremnitz in Hungary. It is a conſiderably firm ſubſtance, of an irregular texture, not compact; much reſembling ſome of our more gaudy marcaſites, but wanting in their hardneſs and weight. It is of no determinate ſhape or ſize; but is often found in ſmall detached maſſes, which are uſually broad, flat, and very rugged at the edges. As to its medical virtues, they are no other than thoſe of the green vitriol.

MITCHELSTOWN, a poſt-town of Ireland, in the county of Cork and province of Munſter in Ireland, 102 miles from Dublin. Here is a college for the ſupport of 12 decayed gentlemen and 12 decayed gentlewomen, who have L. 40 yearly, and handſome apartments, and a chaplain at L. 100 a-year, with a houſe: divine ſervice is daily performed in a neat chapel belonging to the college: the whole was founded by the late earl of Kingſton. Here is alſo a moſt magnificent ſeat of Lord Kingſborough.—Fairs are held at this town 30th July and 12th November.

MITE, a ſmall piece of money mentioned Luke xii. 59. and xxi. 2. In the Greek it is χοδραντης, i. e. *quadrans*, or a quarter of the Roman *denarius*; ſo that the mite was worth about ſeven farthings, or two pence ſterling.

Mite, in zoology. See Acarus.

MITELLA, bastard American sanicle: A genus of the digynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The calyx is quinquefid; the corolla pentapetalous, and inſerted into the calyx; the petals pinnatifid; the capſule unilocular and bivalved, with the valves equal. There are two ſpecies, both natives of North America, riſing with annual herbaceous ſtalks from five or ſix to eight or nine inches in height, and producing ſpikes of ſmall whitiſh flowers, whoſe petals are fringed on their edges. They are eaſily propagated by parting their roots; and ſhould be planted in a ſhady ſituation, and in a ſoft loamy ſoil.

MITHRA, feaſts of, in antiquity, were feaſts celebrated among the Romans in honour of Mithras or the ſun. The moſt ancient inſtance of this Mithras among the Romans occurs in an inſcription dated in the third conſulate of Trajan, or about the year of Chriſt 101. This is the dedication of an altar to the ſun under the above name, thus inſcribed, *Deo Soli Mithræ*. But the worſhip of Mithras was not known in Egypt and Syria in the time of Origen, who died about the year of Chriſt 263; though it was common at Rome for more than a century before this time. The worſhip of Mithras was proſcribed at Rome in the year 378, by order of Gracchus, prefect of the prætorium. According to M. Freret, the feaſts of Mithras were derived from Chaldæa, where they had been inſtituted for celebrating the entrance of the ſun into the ſign Taurus.

MITHRAS, or Mithra, a god of Perſia and Chaldæa, ſuppoſed to be the ſun. His worſhip was introduced at Rome. He is generally repreſented as a young man, whoſe head is covered with a turban after the manner of the Perſians. He ſupports his knee upon a bull that lies on the ground, and one of whoſe horns he holds in one hand, while with the other he plunges a dagger in his neck.

MITHRIDATE, in pharmacy; an antidote, or compoſition, in form of an electuary, ſuppoſed to ſerve either as a remedy or a preſervative againſt poiſons. (See Pharmacy.) It takes its name from the inventor, Mithridates king of Pontus; who is ſaid to have ſo fortified his body againſt poiſons with antidotes and preſervatives, that when he had a mind to diſpatch himſelf, he could not find any poiſon that would take effect. The receipt of it was found in his cabinet, written with his own hand, and was carried to Rome by Pompey. It was tranſlated into verſe by *Damocratus*, a famous phyſician; and was afterwards tranſlated by Galen, from whom we have it; though there is room to imagine it has undergone conſiderable alterations ſince the time of its royal preſcriber.

MITHRIDATES, the name of ſeveral kings of Pontus. See PONTUS.

MITHRIDATES VII. ſurnamed *Eupator* and *the Great*, ſucceeded to the throne at the age of 11 years, about 123 years before the Chriſtian era. The beginning of his reign was marked by ambition, cruelty, and artifice. He murdered his own mother, who had been left by his father coheireſs of the kingdom; and he fortified his conſtitution by drinking antidotes againſt the poiſon with which his enemies at court attempted to deſtroy him. He early inured his body to hardſhip, and employed himſelf in the moſt manly exerciſes, often remaining whole months in the country, and making frozen ſnow and the earth the place of his repoſe. Naturally ambitious and cruel, he ſpared no pains to acquire to himſelf power and dominion. He murdered the two ſons whom his ſiſter Laodice had had by Ariarathes King of Cappadocia, and placed one of his own children, only eight years old, on the vacant throne. Theſe violent proceedings alarmed Nicomedes king of Bithynia, who had married Laodice the widow of Ariarathes. He ſuborned a youth to be king of Cappadocia, as the third ſon of Ariarathes; and Laodice was ſent to Rome to impoſe upon the ſenate, and aſſure them that her third ſon was now alive, and that his pretenſions to the kingdom of Cappadocia were juſt and well founded. Mithridates, on his part, ſent to Rome Gordius the governor of his ſon; who ſolemnly declared before the Roman people, that the youth who ſat on the throne of Cappadocia was the third ſon and lawful heir of Ariarathes, and that he was ſupported as ſuch by Mithridates. This intricate affair diſpleaſed the Roman ſenate: and finally to ſettle the diſpute they took away the kingdom of Cappadocia from Mithridates, and Paphlagonia from Nicomedes. Theſe two kingdoms being thus ſeparated from their original poſſeſſors, were preſented with their freedom and independence; but the Cappadocians refuſed it, and received Ariobarzanes for king. Such were the firſt ſeeds of enmity between Rome and the king of Pontus. Mithridates never loſt an opportunity by which he might leſſen the influence of his adverſaries; and the more effectually to deſtroy their power in Aſia, he ordered all the Romans that were in his dominions to be maſſacred. This was done in one night, and no leſs than 150,000, according to Plutarch, or 80,000 Romans, as Appian mentions, were made the victims of his cruelty. This called aloud for vengeance. Aquilius, and ſoon after Sylla, marched againſt Mithridates with a large army. The former was made priſoner; but Sylla obtained a victory over the king's generals; and another deciſive engagement rendered him maſter of all Greece, Macedonia, Ionia, and Aſia Minor. This ill fortune was aggravated by the loſs of about 200,000 men, who were killed in the ſeveral engagements that had been fought; and Mithridates, weakened by repeated ill ſucceſs by ſea and land, ſued for peace from the conqueror, which he obtained on condition of defraying the expences which the Romans had incurred by the war, and of remaining ſatisfied with the poſſeſſions which he had received from his anceſtors. While theſe negociations of peace were carried on, Mithridates was not unmindful of his real intereſt. His poverty, and not his inclination, obliged him to wiſh for peace. He immediately took the field with an army of 140,000 infantry and 16,000 horſe, which conſiſted of his own forces and thoſe of his ſon-in-law Tigranes king of Armenia. With ſuch a numerous army, he ſoon made himſelf maſter of the Roman provinces in Aſia; none dared to oppoſe his conqueſts; and the Romans, relying on his fidelity, had withdrawn the greateſt part of their armies from the country. The news of his warlike preparations was no ſooner heard, than Lucullus the conſul marched into Aſia; and without delay he blocked up the camp of Mithridates, who was then beſieging Cyzicus. The Aſiatic monarch eſcaped from him, and fled into the heart of his kingdom. Lucullus purſued him with the utmoſt celerity; and would have taken him priſoner after a battle, had not the avidity of his ſoldiers preferred the plundering of a mule loaded with gold to the taking of a monarch who had exerciſed ſuch cruelties againſt their countrymen, and ſhown himſelf ſo faithleſs to the moſt ſolemn engagements. After this eſcape Mithridates was more careful about the ſafety of his perſon; and he even ordered his wives and ſiſters to deſtroy themſelves, fearful of their falling into the enemy's hands. The appointment of Glabrio to the command of the Roman forces, inſtead of Lucullus, was favourable to Mithridates, who recovered the greateſt part of his dominions. The ſudden arrival of Pompey, however, ſoon put an end to his victories. A battle in the night was fought near the Euphrates, in which the troops of Pontus laboured under every diſadvantage. The engagement was by moon-light, and as the moon then ſhone in the face of the enemy, the lengthened ſhadows of the arms of the Romans having induced Mithridates to believe that the two armies were cloſe together, the arrows of his ſoldiers were darted from a great diſtance, and their efforts rendered ineffectual. An univerſal overthrow enſued, and Mithridates, bold in his misfortunes, ruſhed through the thick ranks of the enemy at the head of 800 horſemen, 500 of whom periſhed in the attempt to follow him. He fled to Tigranes; but that monarch refuſed an aſylum to his father-in-law, whom he had before ſupported with all the collected forces of his kingdom. Mithridates found a ſafe retreat among the Scythians; and though deſtitute of power, friends, and reſources, yet he meditated the overthrow of the Roman empire, by penetrating into the heart of Italy by land. Theſe wild projects were rejected by his followers, and he ſued for peace. It was denied to his ambaſſadors; and the victorious Pompey declared, that to obtain it, Mithridates muſt aſk it in perſon. He ſcorned to truſt himſelf in the hands of his enemy, and reſolved to conquer or to die. His ſubjects refuſed to follow him any longer; and revolting from him, made his ſon Pharnaces king. The ſon ſhowed himſelf ungrateful to his father; and even, according to ſome writers, he ordered him to be put to death. This unnatural treatment broke the heart of Mithridates; he obliged his wife to poiſon herſelf, and attempted to do the ſame himſelf. It was in vain: the frequent antidotes he had taken in the early part of his life, ſtrengthened his conſtitution againſt the poiſon; and when this was unavailing, he attempted to ſtab himſelf. The blow was not mortal; and a Gaul who was then preſent, at his own requeſt gave him the fatal ſtroke, about 64 years before the Chriſtian era. Such were the misfortunes, abilities, and miſerable end, of a man, who ſupported himſelf ſo long againſt the power of Rome, and who according to the declarations of the Roman authors, proved a more powerful and indefatigable adverſary to the capital of Italy than the great Annibal, Pyrrhus, Perſeus, or Antiochus. Mithridates has been commended for his eminent virtues, and cenſured for his vices. As a commander, he deſerves the moſt unbounded applauſe; and it may create admiration to ſee him waging war, with ſuch ſucceſs, during ſo many years, againſt the moſt powerful people on earth, led to the field by a Sylla, a Lucullus, and a Pompey. He was the greateſt monarch that ever ſat on a throne, according to the opinion of Cicero; and indeed no greater proof of his military character can be brought, than the mention of the great rejoicings which happened in the Roman armies and in the capital at the news of his death. No leſs than 12 weeks were appointed for public thankſgivings to the immortal gods; and Pompey, who had ſent the firſt intelligence of his death to Rome, and who had partly haſtened his fall, was rewarded with the moſt uncommon honours. It is ſaid that Mithridates conquered 24 nations, whoſe different languages he knew, and ſpoke with the ſame eaſe and fluency as his own. As a man of letters he alſo deſerves attention. He was acquainted with the Greek language, and even wrote in that dialect a treatiſe on botany. His ſkill in phyſic is well known; and even now there is a celebrated antidote which bears his name, and is called *mithridate*. Superſtition as well as nature had united to render him great; and if we rely upon the authority of Juſtin, his birth was accompanied by the appearance of two large comets, which were ſeen for 70 days ſucceſſively, and whoſe ſplendor eclipſed the mid-day ſun, and covered the fourth part of the heavens.

MITHRIDATICUM bellum, the *Mithridatic War*, one of the longeſt and moſt celebrated wars ever carried on by the Romans againſt a foreign power. See Pontus.

MITRA, was a cap or covering for the head, worn by the Roman ladies, and ſometimes by the men; but it was looked upon as a mark of effeminacy in the laſt, eſpecially when it was tied upon their heads.

MITRE, a ſacerdotal ornament worn on the head, by biſhops and certain abbots on ſolemn occaſions: being a ſort of cap, pointed and cleft at top. The high prieſt among the Jews wore a mitre or bonnet on his head. The inferior prieſts of the ſame nation had likewiſe their mitres; but in what reſpect they differed from that of the high-prieſt, is uncertain. Some contend that the ancient biſhops wore mitres; but this is by no means certain.

Mitre, in architecture, is the workmens term for an angle that is juſt 45 degrees, or half a right one. If the angle be a quarter of a right angle, they call it a *half-mitre*.

To deſcribe ſuch angles, they have an inſtrument called the *mitre-ſquare*; with this they ſtrike mitre-lines on their quarters or battens; and for diſpatch, they have a *mitre-box*, as they call it, which is made of two pieces of wood, each about an inch thick, one nailed upright on the edge of the other; the upper piece hath the mitre-lines ſtruck upon it on both ſides, and a kerf to direct the ſaw in cutting the mitre-joints readily, by only applying the piece into this box.

Mitre is uſed by the writers of the Iriſh hiſtory for a ſort of baſe money, which was very common there about the year 1270, and for 30 years before and as many after.

There were beſide the mitre ſeveral other pieces called according to the figures impreſſed upon them, roſaries, lionades, eagles, and by the like names. They were imported from France and other countries, and were ſo much below the proper currency of the kingdom, that they were not worth ſo much as a halfpenny each. They were at length decryed in the year 1300, and good coins ſtruck in their place. Theſe were the firſt Iriſh coins in which the ſceptre was left out. They were ſtruck in the reign of Edward, the ſon of Henry III. and are ſtill found among the other antiquities of that country. They have the king's head in a triangle full-faced. The penny when well preſerved, weighs 22 grains; the halfpenny 10½ grains.

MITTAU, the capital of the Duchy of Courland. It is ſtrongly fortified; but was taken by the Swedes in 1701, and by the Muſcovites in 1706. E. Long. 23. 51. N. Lat. 56. 44.

MITTIMUS, as generally uſed, hath two ſignifications. 1. It ſignifies a writ for removing or tranſferring of records from one court to another. 2. It ſignifies a precept, or command in writing, under the hand and ſeal of a juſtice of the peace, directed to the gaoler or keeper of ſome priſon, for the receiving and ſafe keeping of an offender charged with any crime, until he be delivered by due courſe of law.

MITYLENE, or Mytelene (anc. geog.), a celebrated, powerful, and affluent city, capital of the iſland of Leſbos. It receives its name from *Mitylene*, the daughter of Macareus, a king of the country. It is greatly commended by the ancients for the ſtatelineſs of its buildings and the fruitfulneſs of its ſoil, but more particularly for the great men it produced: Pittacus, Alcæus, Sappho, Terpander, Theophanes, Hellanicus, &c. were all natives of Mitylene. It was long a ſeat of learning; and with Rhodes and Athens, it had the honour of having educated many of the great men of Rome and Greece. In the Peloponneſian war, the Mitylenеans ſuffered greatly for their revolt from the power of Athens; and in the Mithridatic wars, they had the boldneſs to reſiſt the Romans, and diſdain the treaties which had been made between Mithridates, and Sylla. See Metelin.

MIXT, or Mixt body, in chemiſtry, that which is compounded of different elements or principles.

MIXTURE, a compound or aſſemblage of ſeveral different bodies in the ſame maſs. Simple mixture, conſiſts only in the ſimple appoſition of parts of different bodies to each other. Thus, when powders of different kinds are rubbed together, the mixture is only ſimple, and each of the powders retains its particular characters. In like manner, when oil and water are mixed together, though the parts of both are confounded, ſo that the liquor may appear to be homogeneous, we cannot ſay that there is any more than a ſimple appoſition of the parts, as the oil and water may very eaſily be again ſeparated from each other. But the caſe is very different when bodies are *chemically* mixed; for then one or both bodies aſſume new properties, and can by no means be diſcovered in their proper form without a particular chemical proceſs adapted to this purpoſe. Hence chemical mixture is attended with many phenomena which are never obſerved in ſimple mixtures; ſuch as heat, efferveſcence, &c. To chemical mixture belongs the union of acids and alkalies, the amalgamation of metals, ſolution of gums, &c. and upon it depend many of the principal operations of Chemistry. See the article *paſſim*.

Mixture, in pharmacy, a medicine which differs from a julep in this reſpect, that it receives into its compoſition not only ſalts, extracts, and other ſubſtances diſſoluble in water; but alſo earths, powders, and ſuch ſubſtances as cannot be diſſolved.

MIZEN, in the ſea-language, is a particular maſt or ſail. The mizen-maſt ſtands in the ſternmoſt part of the ſhip. In ſome great ſhips there are two of theſe; when that next the main-maſt is called the *main-mizen*, and that next the poop the *bonaventure mizen*.

MIZRAIM, or Misraim, the dual name of Egypt, uſed in ſcripture to denote the Higher and Lower Egypt, which ſee. It ſometimes occurs ſingular, *Mazor:* 2 Kings xix. Iſaiah xix. Micah vii.

MNEMOSYNE (fab. hiſt.), a daughter of Cœlus and Terra. She maried Jupiter, by whom ſhe had the nine muſes. The word *mnemoſyne* ſignifies "memory;" and therefore the poets have rightly called Memory the mother of the muſes, becauſe it is to that mental endowment that mankind are indebted for their progreſs in ſcience.

MNIUM, MARSHMOSS; a genus of the natural order of muſci, belonging to the cryptogamia claſs of plants. The anthera is operculated; the calyptra ſmooth; the female capitulum naked and powdery, remote. There are 18 ſpecies, of which ſeven are natives of Britain; but none have any remarkable property except the two following. 1. The fontanum is an elegant moſs, frequent in bogs, and on the borders of cold ſprings. It is from two to four inches high: the ſtalks are ſimple at the baſe, and covered with a ruſty down; but higher up are red, and divided into ſeveral round, ſingle, taper branches, which proceed nearly from the ſame point. The leaves are not more than $\frac{1}{12}$th of an inch long, lanceolate and acute, of a whitiſh green colour; and ſo thinly ſet, that the red ſtalk appears between them. This moſs, as it may be ſeen at a conſiderable diſtance, is a good mark to lead to the diſcovery of clear and cold ſprings. Linnæus informs us, that the Laplanders are well acquainted with this ſign. Dr Withering informs us, that wherever this moſs grows, a ſpring of freſh water may be found without much digging. 2. The hygrometricum grows in woods, heaths, garden-walks, walls, old trees, decayed wood, and where coals or cinders have been laid. It is ſtemleſs, hath tips inverſely egg-ſhaped, nodding, and bright yellow. If the fruit-ſtalk is moiſtened at the baſe with a little water or ſteam, the head makes three or four revolutions: if the head is moiſtened, it turns back again.

MOAB (anc. geog.), a country of Arabia Petræa; ſo called from Moab the ſon of Lot, to whoſe poſterity this country was allotted by divine appointment, Deut. xi. 9. It was originally occupied by the Emim, a race of giants extirpated by the Moabites, *ibid.* Moab anciently lay to the ſouth of Ammon, before Sihon the Amorite ſtripped both nations of a part of their territory, afterwards occupied by the Iſraelites, Numb. xxi.; and then Moab was bounded by the river Arnon to the north, the Lacus Aſphaltites to the weſt, the brook Zared to the ſouth, and the mountains Abarim to the eaſt.

MOAT, or Ditch, in fortification, a deep trench dug round the rampart of a fortified place, to prevent ſurpriſes.

The brink of the moat, next the rampart, is called the *ſcarpe;* and the oppoſite one, the *counterſcarpe*.

A dry moat round a large place, with a ſtrong garriſon, is preferable to one full of water; becauſe the paſſage may be diſputed inch by inch, and the beſiegers, when lodged in it, are continually expoſed to the bombs, granades, and other fire-works, which are thrown inceſſantly from the rampart into their works. In the middle of dry moats, there is ſometimes another ſmall one, called *cunette;* which is generally dug ſo deep till they find water to fill it.

The deepeſt and broadeſt moats are accounted the beſt; but a deep one is preferable to a broad one: the ordinary breadth is about 20 fathoms, and the depth about 16.

To drain a moat that is full of water, they dig a trench deeper than the level of the water, to let it run off; and then throw hurdles upon the mud and ſlime, covering them with earth or bundles of ruſhes, to make a ſure and firm paſſage.

MOATAZALITES, or Separatists, a religious ſect among the Turks, who deny all forms and qualities in the Divine Being; or who diveſt God of his attributes.

There are two opinions among the Turkiſh divines concerning God. The firſt admits metaphyſical forms or attributes; as, that God has wiſdom, by which he is wiſe; power, by which he is powerful; eternity, by which he is eternal, &c. The ſecond allows God to be wiſe, powerful, eternal; but will not allow any form or quality in God, for fear of admitting a multiplicity. Thoſe who follow this latter opinion are called *Moatazalites;* they who follow the former, *Sephalites.*

The Moatazalites alſo believed that the word of God was created *in ſubjecto*, as the ſchoolmen term it; and to conſiſt of letters and ſounds; copies thereof being written in books to expreſs or imitate the original; they denied abſolute prediſtination, and affirmed that man is a free agent. This ſect is ſaid to have firſt invented the ſcholaſtic divinity, and is ſubdivided into no leſs than 20 inferior ſects, which mutually brand one another with infidelity.

MOBILE, MOVEABLE, any thing ſuſceptible of motion, or that is diſpoſed to be moved either by itſelf or by ſome other prior *mobile* or mover.

Primum Mobile, in the ancient aſtronomy, was a ninth heaven or ſphere, imagined above thoſe of the planets and fixed ſtars. This was ſuppoſed to be the firſt mover, and to carry all the lower ſpheres round along with it; by its rapidity communicating to them a motion whereby they revolved in 24 hours. But the diurnal revolution of the planets is now accounted for without the aſſiſtance of any ſuch *primum mobile*.

Perpetuum Mobile. See *Perpetual Motion*.

MOCHO, Moco, or *Mokha*; by ſome ſuppoſed to be the Muſa or Muza of Ptolemy, is a port and town on the Red Sea, of conſiderable trade; contains about 10,000 inhabitants, Jews, Armenians, and Mohammedans; is ſurrounded with walls after the ancient manner; and has four gates and four towers, the laſt mounted with cannon; but there is no ditch. It gives name to a kingdom extending along the moſt ſouthern coaſt of Arabia; of which that part which lies next the ſea is a dry barren deſart, in ſome places 10 or 12 leagues over; but bounded by mountains, which being well watered, enjoy an almoſt perpetual ſpring; and beſides coffee, the peculiar produce of this country, yields corn, grapes, myrrh, frankincenſe, caſſia, balm, gums of ſeveral ſorts, mangos, dates, pomegranates, &c. The weather here is ſo hot and ſultry in ſummer, eſpecially when the ſouth wind blows, that it would be inſupportable, if it was not mitigated by the cool breezes that generally blow from the mountains on the north, or the Red and Arabic Seas on the weſt and eaſt. The heat in winter is equal to that of the warmeſt ſummers of England; and it is very ſeldom that either clouds or rain are ſeen. The city of Mocho is now the emporium for the trade of all India to the Red Sea. The trade was removed hither from Aden, in conſequence of the prophecy of a ſheik, much revered by the people, who foretold that it would ſoon become a place of extenſive commerce notwithſtanding its diſadvantageous ſituation. It ſtands cloſe to the ſea, in a large, dry, and ſandy plain, that affords no good water within 20 miles of the city; what they drink comes from Moſa, and coſts as dear as ſmall-beer in England. The water near the town, as it is thought, produces a worm, which the naturaliſts call the *dracunculus*, which is about two feet and a half long, very ſlender, and breeds in the fleſhy parts of the body: in extracting it great care muſt be uſed, the conſequence being dangerous if any part of it remains in the body. The buildings here are lofty, and tolerably regular, having a pleaſant aſpect from Mecca. The ſteeples of ſeveral moſques are very high, preſenting themſelves to view at a great diſtance. Their markets are well ſtored with beef, mutton, lamb, kid, camels, and antelopes fleſh, common fowls, Guinea hens, partridges, and pigeons. The ſea affords plenty of fiſh, but not ſavoury; which ſome think proceeds from the extreme ſaltneſs of the water, and the nature of their aliment. The markets are alſo ſtocked with fruit, ſuch as grapes, peaches, apricots, quinces, and nectarines; although neither ſhrub nor tree is to be ſeen near the town, except a few date-trees. Frequently no rain falls here in two or three years, and ſeldom more than a ſhower or two in a year; but in the mountains, at the diſtance of about 20 miles from Mokha, the earth is watered with a gentle ſhower every morning, which makes the valleys fertile in corn and the fruits natural to the climate. The Arab inhabitants, though remarkably grave and ſuperſtitious, are ſaid to be extremely covetous and hypocritical; robbing, thieving, and committing piracy, without the leaſt ſcruple or remorſe. The Engliſh and Dutch companies have handſome houſes here, and carry on a great trade in coffee, olibanum, myrrh, aloes, liquid ſtorax, white and yellow arſenic, gum-arabic, mummy, balm of Gilead, and other drugs. One inconvenience, however, they ſuſtain from the violence and exactions of the Arabian princes; but the king's cuſtoms are eaſy, being fixed at three *per cent.* to Europeans. Of the coins at Mocho, the moſt current is the camaſſie, which riſes and falls in value at the banker's diſcretion: they are from 50 to 80 for a current dollar, which is but an imaginary ſpecies, being always reckoned one and a half *per cent.* lower than Spaniſh dollars. As to their weights, they are almoſt infinite, according to the nature of the thing to be weighed: they have the banian weight, the magnet, the ambergris, the agala, the gold and ſilver weights, &c.

MOCK-ore, or *Mock-Lead*. See Blende.

MOCKING-bird, in ornithology. See Turdus.

MOCOCO. See Lemur.

MODE, which is a word of the ſame general import with manner, is uſed as a technical term in grammar, metaphyſics, and muſic. For its import in Grammar, ſee that article, n° 80.

Mode, in metaphyſics, ſeems properly to denote the manner of a thing's exiſtence: but Locke, whoſe language in that ſcience is generally adopted, uſes the word in a ſenſe ſomewhat different from its ordinary and proper ſignification. "Such complex ideas, which, however compounded, contain not in them the ſuppoſition of ſubſiſting by themſelves, but are conſidered as dependencies on, or affections of, ſubſtances," he calls *modes*. Of theſe *modes*, there are, according to him, two ſorts, which deſerve diſtinct conſideration. Firſt, there are ſome "which are only variations, or different combinations of the ſame ſimple idea, without the mixture of any other, as *a dozen* or *a ſcore*; which are nothing but the ideas of ſo many diſtinct units added together:" and theſe he calls *ſimple modes*. Secondly, "there are others compounded of ſimple ideas of ſeveral kinds put together to make one complex one; *e. g. beauty*, conſiſting of a certain compoſition of colour and figure, cauſing delight in the beholder; *theft*, which being the concealed change of the poſſeſſion of any thing without the conſent of the proprietor, contains, as is viſible, a combination of ſeveral ideas of ſeveral kinds;" and theſe he calls *mixed modes*. For the juſt diſtinction between *ideas* and *notions*, as well as between *ideas* and the *qualities* of external objects, which in this account of modes are all confounded together, ſee Metaphysics.

Mode, in muſic; a regular diſpoſition of the air and accompaniments relative to certain principal ſounds upon which a piece of muſic is formed, and which are called the *eſſential ſounds of the mode*.

There is this difference between the mode and the tone, that the latter only determines the principal ſound, and indicates the place which is moſt proper to be occupied by that ſyſtem which ought to conſtitute the baſs of the air, whereas the former regulates the thirds, and modifies the whole ſcale agreeably to its fundamental ſounds.

Our *modes* are not, like thoſe of the ancients, characteriſed by any ſentiment which they tend to excite, but reſult from our ſyſtem of harmony alone. The ſounds eſſential to the mode are in number three, and form together one perfect chord. 1. The tonic or key, which is the fundamental note both of the tone and of the mode: (See Tone and Tonic). 2. The dominant, which is a fifth from the tonic: (See Dominant). 3. The mediant, which properly conſtitutes the *mode*, and which is a third from the ſame tonic. As this third may be of two kinds, there are of conſequence two different modes. When the mediant forms a greater third with the tonic, the mode is major; when the third is leſſer, it is minor.

The major mode is immediately generated by the reſonance of ſounding bodies, which exhibit the third major of the fundamental ſound: but the minor mode is not the product of nature; it is only found by analogy and inverſion. This is equally true upon the ſyſtem of Sig. Tartini as upon that of M. Rameau.

This laſt author, in his various and ſucceſſive publications, has explained the origin of this minor mode in different ways, of which his interpreter M. d'Alembert was ſatiſfied with none. It is for this reaſon that he has founded this origin on a different principle, which cannot be better explained than in the words of that eminent geometrician. See Music, Art. 28, 29, 30, and 31.

When the mode is once determined, every note in the ſcale aſſumes a name expreſſive of its relation to the fundamental ſound, and peculiar to the place which it occupies in that particular mode. We ſubjoin the names of all the notes ſignificant of their relative values and places in each particular *mode*, taking the octave of *ut* as an example of the major *mode*, and of *la* as an example of the minor.

Major,	*ut*	*re*	*mi*	*fa*	*ſol*	*la*	*ſi*	*ut*
Minor,	*la*	*ſi*	*ut*	*re*	*mi*	*fa*	*ſol*	*la*
	Tonic.	Second note.	Mediant.	Fourth note, or Sub-dominant.	Dominant.	Sixth note, or Sub-dominant.	Seventh note.	Octave.

It is neceſſary to remark, that when the ſeventh note is only a ſemitone diſtant from the higheſt in the octave, that is to ſay, when it forms a third major with the dominant, as *ſi* natural in the major *mode*, or *ſol* ſharp in the minor, that ſeventh ſound is then called a *ſenſible note*, becauſe it diſcovers the tonic and renders the tone apreciable.

Nor does each gradation only aſſume that name which is ſuitable to it; but the nature of each interval is determined according to its relation to the *mode*. The rules eſtabliſhed for this are as follow:

1. The ſecond note muſt form a ſecond major above the tonic, the fourth note and the dominant ſhould form a fourth and fifth exactly true; and this equally in both modes.

2. In the major mode, the mediant or third, the ſixth and the ſeventh from the tonic, ſhould always be major; for by this the mode is characteriſed. For the ſame reaſon theſe three intervals ought always to be minor in the minor mode: nevertheleſs, as it is neceſſary that the ſenſible note ſhould likewiſe there be perceived, which cannot be effectuated without a falſe relation whilſt the ſixth note ſtill remains minor; this occaſions exceptions, of which in the courſe of the air or harmony care muſt be taken. But it is always neceſſary that the cleff, with its tranſpoſitions, ſhould preſerve all the intervals, as determined with relation to the tonic, according to the ſpecies of the *mode*. For this a general rule will be found at the word *Cleff*, in Rouſſeau's Muſical Dictionary.

As all the natural chords in the octave of *ut* give, with relation to that tonic, all the intervals preſcribed for the major *mode*, and as the caſe is the ſame with the octave of *la* for the minor mode, the preceding example, which was only given that we might have an opportunity of naming the notes, may likewiſe ſerve as a formula for the rule of the intervals in each *mode*.

This rule is not, as one might imagine, eſtabliſhed upon principles that are merely arbitrary: it has its ſource in the generation of harmony, at leaſt in a certain degree. If you give a perfect major chord to the tonic, to the dominant, and the ſub-dominant, you will have all the ſounds of the diatonic ſcale for the major *mode*: to obtain that of the minor, leaving ſtill its third major to the dominant, give a third minor to the two other chords. Such is the analogy of the mode.

As this mixture of major and minor chords introduces into the minor mode a falſe relation between the ſixth and the ſenſible note, to avoid this falſe relation, they ſometimes give the third major to the fourth note in aſcent, or the third minor to the dominant in deſcending, chiefly by inverting the chords; but theſe in this caſe are licences.

There are properly no more than two *modes*, as we have ſeen: but there are twelve different ſounds in the octave which may be made fundamental ſounds, and of conſequence form as many keys or tones; and as each of theſe tones are ſuſceptible of the major or minor mode, muſic may be compoſed in twenty-four modes or manners. Nay, in the manner of writing muſic, there are even thirty-four paſſable modes: but in practice ten are excluded; which when thoroughly examined are nothing elſe but a repetition of the other ten, under relations much more difficult, in which all the chords muſt change their names, and where it muſt coſt any one ſome trouble to know what he is about. Such is the major mode upon a note raiſed above its natural pitch by a ſemitone, and the minor mode upon a note depreſſed by a ſemitone. Thus, inſtead of compoſing upon *ſol* ſharp with a third major, it is much more eligible to operate upon *la* flat, which will give you an opportunity to employ the ſame tones; and inſtead of compoſing upon *re* flat with a third minor, you will find it more convenient to chooſe *ut* ſharp for the ſame reaſon; viz. on one hand to avoid a *fa* with a double ſharp, which would be equivalent to a *ſol* natural; and on the other hand a *ſi* with a double flat, which would become a *la* natural.

The compoſer does not always continue in the ſame *mode*, nor in the ſame *key*, in which he has begun an air; but, whether to alter the expreſſion or introduce variety, *modes* and *keys* are frequently changed, according to the analogy of harmony; yet always returning to thoſe which have been firſt heard: this is called *modulation*.

Mode.

From thence ariſes a new diviſion of *modes* into ſuch as are *principal* and ſuch as are *relative*: the principal is that in which the piece begins and ends; the relative modes are ſuch as the compoſer interweaves with the principal in the flow of the harmony. (See MODULATION).

Others have propoſed a third ſpecies, which they call a *mixed mode*, becauſe it participates the modulation of both the others, or rather becauſe it is compoſed of them; a mixture which they did not reckon an inconveniency, but rather an advantage, as it increaſes the variety, and gives the compoſer a greater latitude both in air and harmony.

This new mode, not being found by the analyſis of the three chords like the two former, is not determined, like them, by harmonics eſſential to the mode, but by an entire ſcale which is peculiar to itſelf, as well in riſing as deſcending; ſo that in the two modes abovementioned the ſcale is inveſtigated by the chords; and in this mixed mode the chords are inveſtigated by the ſcale. The following notes exhibit the form of this ſcale in ſucceſſion, as well riſing as deſcending:

mi fa ſol la ſi ut re mi.

Of which the eſſential difference is, as to the *melody*, in the poſition of the two ſemitones; of which the firſt is found between the firſt and the ſecond note, and the laſt between the fifth and ſixth; and, with reſpect to the *harmony*, the difference conſiſts in this, that upon its tonic it carries a third minor in the beginning, and major in ending, in the accompaniment of this ſcale, as well in riſing as deſcending, ſuch as it has been given by thoſe who propoſed it, and executed at a ſpiritual concert, May 30, 1751.

They object to its inventor, That his mode has neither chords nor harmony eſſential to itſelf, nor cadencies which are peculiar to it, and which ſufficiently diſtinguiſh it from the major or minor mode. He anſwers to this, That the diſtinction of his mode is leſs in harmony than in melody, and leſs even in the mode itſelf than in the modulation; that in its beginning it is diſtinguiſhed from the major mode by its third minor, and in its end from the minor mode by its plagal cadence. To which his opponents reply, That a modulation which is not excluſive cannot be ſufficient to eſtabliſh a mode; and that his muſt inevitably occur in the two other modes, and above all in the minor; and, as to his plagal cadence, that it neceſſarily takes place in the minor mode as often as tranſition is made from the chord of the tonic to that of the dominant, as has long been the caſe in practice, even upon final notes, in plagal modes, and in the tone proper to the fourth. From whence it is concluded, that his mixed mode is not ſo much a particular ſpecies, as a new denomination for the manner of interweaving and combining the major and minor modes, as ancient as harmony, practiſed at all periods; and this appears to be ſo true, that, even when he begins his ſcale, its author will neither venture to give the fifth nor the ſixth to his tonic, for fear leſt by the firſt the tonic ſhould be determined in the minor mode, or the mediant in the major mode by the ſecond. He leaves the harmony equivocal by not filling up his chord.

But whatever objections may be made againſt the mixed mode, whoſe name is rather rejected than its practice, this will not prevent the author from appearing as a man of genius, and a muſician profoundly learned in the principles of his art, by the manner in which he treats it, and the arguments which he uſes to eſtabliſh it.

Mode, Model.

MODE *Major*. } See INTERVAL.
MODE *Minor*. }

MODEL, in a general ſenſe, an original pattern, propoſed for any one to copy or imitate.

1
Different kinds of models.

This word is particularly uſed in building, for an artificial pattern made in wood, ſtone, plaſter, or other matter, with all its parts and proportions, in order for the better conducting and executing ſome great work, and to give an idea of the effect it will have in large. In all great buildings, it is much the ſureſt way to make a model in relievo, and not to truſt to a bare deſign or draught. There are alſo models for the building of ſhips, &c. and for extraordinary ſtaircaſes, &c.

They alſo uſe models in painting and ſculpture; whence, in the academies, they give the term *model* to a naked man or woman, diſpoſed in ſeveral poſtures, to afford an opportunity to the ſcholars to deſign him in various views and attitudes.

2
General method of making models.

Models in imitation of any natural or artificial ſubſtance, are moſt uſually made by means of moulds compoſed of plaſter of Paris. For the purpoſe of making theſe moulds, this kind of plaſter is much more fit than any other ſubſtance, on account of the power it has of abſorbing water, and ſoon condenſing into an hard ſubſtance, even after it has been rendered ſo thin as to be of the conſiſtence of cream. This happens in a ſhorter or longer time as the plaſter is of a better or worſe quality; and its good or bad properties depend very much upon its age, to which, therefore, particular regard ought to be had. It is ſold in the ſhops at very different prices; the fineſt being made uſe of for caſts, and the midling ſort for moulds. It may be very eaſily coloured by means of almoſt any kind of powder excepting what contains an alkaline ſalt; for this would chemically decompoſe the ſubſtance of it, and render it unfit for uſe. A very conſiderable quantity of chalk would alſo render it ſoft and uſeleſs, but lime hardens it to a great degree. The addition of common ſize will likewiſe render it much harder than if mere water is made uſe of. In making either moulds or models, however, we muſt be careful not to make the mixture too thick at firſt; for if this is done, and more water added to thin it, the compoſition muſt always prove brittle and of a bad quality.

The particular manner of making models (or *caſts*, as they are alſo called) depends on the form of the ſubject to be taken. The proceſs is eaſy, where the parts are elevated only in a ſlight degree, or where they form only a right or obtuſe angle with the principal ſurface from which they project; but where the parts project in ſmaller angles or form curves inclined towards the principal ſurface, the work is more difficult. This obſervation, however, holds good only with regard to hard and inflexible bodies; for ſuch as are ſoft may often be freed from the mould, even though they have the ſhape laſt mentioned. But

Model.

though this be the caſe with the ſoft original ſubſtance, it is not ſo with the inflexible model when once it is caſt.

The moulds are to be made of various degrees of thickneſs, according to the ſize of the model to be caſt; and may be from half an inch to an inch, or, if very large, an inch and an half. Where a number of models are to be taken from one mould, it will likewiſe be neceſſary to have it of a ſtronger contexture than where only a few are required, for very obvious reaſons.

3
Anatomical models.

It is much more eaſy to make a mould for any ſoft ſubſtance than a rigid one, as in any of the viſcera of the animal body: for the fluidity of the mixture makes it eaſily accommodate itſelf to the projective parts of the ſubſtance; and as it is neceſſary to inflate theſe ſubſtances, they may be very readily extracted again by letting out the air which diſtended them.

When a model is to be taken, the ſurface of the original is firſt to be greaſed, in order to prevent the plaſter from ſticking to it; but if the ſubſtance itſelf is ſlippery, as is the caſe with the internal parts of the human body, this need not be done: when neceſſary, it may be laid over with linſeed oil by means of a painter's bruſh. The original is then to be laid on a ſmooth table, previouſly greaſed or covered with a cloth, to prevent the plaſter ſticking to it; then ſurround the original with a frame or ridge of glazier's putty, at ſuch a diſtance from it as will admit the plaſter to reſt upon the table on all ſides of the ſubject for about an inch, or as much as is ſufficient to give the proper degree of ſtrength to the mould. A ſufficient quantity of plaſter is then to be poured as uniformly as poſſible over the whole ſubſtance, until it be every where covered to ſuch a thickneſs as to give a proper ſubſtance to the mould, which may vary in proportion to the ſize. The whole muſt then be ſuffered to remain in this condition till the plaſter has attained its hardneſs; when the frame is taken away, the mould may be inverted, and the ſubject removed from it; and when the plaſter is thoroughly dry let it be well ſeaſoned.

Pole's Anatomical Inſtructor.

Having formed and ſeaſoned the moulds, they muſt next be prepared for the caſts by greaſing the inſide of them with a mixture of olive oil and lard in equal parts, and then filled with fine fluid plaſter, and the plain of the mould formed by its reſting on the ſurface of the table covered to a ſufficient thickneſs with coarſe plaſter, to form a ſtrong baſis or ſupport for the caſt where this ſupport is requiſite, as is particularly the caſe where the thin and membranous parts of the body are to be repreſented. After the plaſter is poured into the mould, it muſt be ſuffered to ſtand until it has acquired the greateſt degree of hardneſs it will receive: after which the mould muſt be removed: but this will be attended with ſome difficulty when the ſhape of the ſubject is unfavourable; and in ſome caſes the mould muſt be ſeparated by means of a ſmall mallet and chiſſel. If by theſe inſtruments any parts of the model ſhould be broken off, they may be cemented by making the two ſurfaces to be applied to each other quite wet; then interpoſing betwixt them a little liquid plaſter; and laſtly, the joint ſmoothed after being thoroughly dry. Any ſmall holes that may be made in the mould can be filled up with liquid plaſter, after the ſides of them have been thoroughly wetted, and ſmoothed over with the edge of a knife.

Model.

In many caſes it is altogether impracticable to prepare a mould of one piece for a whole ſubject; and therefore it muſt be conſidered how this can be done in ſuch a manner as to divide the mould into the feweſt pieces. This may be effected by making every piece cover as much of the pattern as poſſible, without ſurrounding ſuch projecting parts, or running into ſuch hollows as would not admit a ſeparation of the mould. It is impoſſible, however, to give any particular directions in this matter which can hold good in every inſtance, the number of pieces of which the mould is to conſiſt being always determined from the ſhape of the pattern. Thus the mould of the human calculus will require no more than three pieces, but that of an *os femoris* could ſcarce have fewer than ten or twelve.—Where any internal pieces are required, they are firſt to be made, and then the outer pieces after the former have become hard.

To make a mould upon an hard and dry ſubſtance, we muſt, in the firſt place, rub the ſurface of it ſmoothly over with the mixture of oil and lard abovementioned. Such hollows as require internal pieces are then to be filled up with fluid plaſter; and while it continues in this ſtate, a wire loop muſt be introduced into it, by which, when hardened, it can be pulled off. The plaſter ſhould be ſomewhat raiſed in a pyramidal form round this wire, and afterwards cut ſmooth with a knife while yet in its ſoft ſtate; preſerving two or three angular ridges from the loop to the outer edge, that it may fix the more ſteadily in the outer piece of the mould to be afterwards made upon it. Let the outer piece then be well greaſed, to prevent the ſecond piece from adhering; the loop being incloſed with ſome glazier's putty, both to prevent the ſecond piece from adhering and to preſerve an hollow place for the cord.

To form the ſecond or outſide piece, mix a quantity of plaſter proportioned to the extent of ſurface it is to cover and the intended thickneſs of the mould: when it is juſt beginning to thicken, or aſſumes ſuch a conſiſtence as not to run off very eaſily, ſpread it over the internal piece or pieces as well as the pattern, taking care at the ſame time not to go too far leſt it ſhould not deliver ſafely; and as the plaſter becomes more tenacious, add more upon the pattern until it has become ſufficiently thick, keeping the edges ſquare and ſmooth like the edge of a board. The plaſter ſhould be ſpread equally upon all parts, which is beſt done by a painter's pallet-knife or apothecary's bolus-knife: but for this the inſtrument ſhould be ſomewhat leſs pliable than it is commonly made.

When the outſide piece is hardened, the edges are to be pared ſmooth, and nearly made ſquare with a ſmall pointed knife. Little holes of a conical ſhape are to be made with the point of a knife about an inch diſtant from one another, according to the ſize of the piece. Theſe are deſigned to receive the fluid plaſter in forming the adjacent parts of the mould, and occaſion points correſponding to the hollows; and are intended to preſerve the edges of the different pieces ſteadily in their proper relative ſituations. The third piece is then to be formed in a manner ſimilar to the ſecond; greaſing the edges of the former plentifully with hog's lard and oil, to prevent the pieces from adhering to each other. Thus the pattern is to be wholly incloſed, only leaving a proper orifice for pouring in the plaſter to form the model; ſmall holes being alſo bored in the mould oppoſite to the wire-loops fixed in the inſide pieces, through which a cord is to be conveyed from the loop to confine ſuch pieces during the time of caſting. In ſome caſes, however, it is not neceſſary that the mould ſhould totally incloſe the pattern; for inſtance, where a model is to be made of a pedeſtal, or a buſt of any part of the human body. The bottom of ſuch moulds being left open, there is accordingly ample room for pouring in the plaſter.

After the mould is completely formed, it is next to be dried either naturally or by a gentle artificial heat, and then ſeaſoned in the following manner:—Having been made thoroughly dry, which, if the mould is large, will require two or three weeks, it is to be bruſhed over plentifully with linſeed oil boiled with ſugar of lead, finely levigated litharge or oil of vitriol. The inſide and joints of the mould ſhould be particularly well ſupplied with it. If the mould be large, it is needleſs to attend to the outſide: but when the moulds are ſmall, it will not be improper to boil them in the oil; by which means their pores are more exactly filled than could otherwiſe be done. After the moulds have undergone this operation, they are again ſet by to dry, when, being greaſed with olive-oil and hog's lard, they are fit for uſe. If linſeed oil be uſed for greaſing the moulds, it will in a ſhort time impart a diſagreeable yellow colour to the caſts.

The mould being properly prepared and ſeaſoned, nothing more is requiſite to form the model than to pour the fineſt liquid plaſter of Paris into it. After a layer of this, about half an inch in thickneſs, has been formed all round the mould, we may uſe the coarſer kind to fill it up entirely, or to give to the model what thickneſs we pleaſe.

4
Models from living ſubjects.

Beſides the models which are taken from inanimate bodies, it has been frequently attempted to take the exact reſemblance of people while living, by uſing their face as the original of a model, from whence to take a mould; and the operation, however diſagreeable, has been ſubmitted to by perſons of the higheſt ranks in life. A conſiderable difficulty occurs in this, however, by reaſon of the perſon's being apt to ſhrink and diſtort his features when the liquid is poured upon him; neither is he altogether without danger of ſuffocation, unleſs the operator well underſtands his buſineſs.

To avoid the former inconvenience, it will be proper to mix the plaſter with warm inſtead of cold water, by which means the perſon will be under no temptation to ſhrink; and to prevent any danger of a fatal accident, the following method is to be practiſed: Having laid the perſon horizontally on his back, the head muſt firſt be raiſed by means of a pillow to the exact poſition in which it is naturally carried when the body is erect; then the parts to be repreſented muſt be very thinly covered over with fine oil of almonds by means of a painter's bruſh: the face is then to be firſt covered with fine fluid plaſter, beginning at the upper part of the fore-head, and ſpreading it over the eyes, which are to be kept cloſe, that the plaſter may not come in contact with the globe; yet not cloſed ſo ſtrongly as to cauſe any unnatural wrinkles. Cover then the noſe and ears, plugging firſt up the *meatus auditorii* with cotton, and the noſtrils with a ſmall quantity of tow rolled up, of a proper ſize, to exclude the plaſter. During the time that the noſe is thus ſtopped, the perſon is to breathe through the mouth: in this ſtate the fluid plaſter is to be brought down low enough to cover the upper lip, obſerving to leave the rolls of tow projecting out of the plaſter. When the operation is thus far carried on, the plaſter muſt be ſuffered to harden; after which the tow may be withdrawn, and the noſtrils left free and open for breathing. The mouth is then to be cloſed in its natural poſition, and the plaſter brought down to the extremity of the chin. Begin then to cover that part of the breaſt which is to be repreſented, and ſpread the plaſter to the outſides of the arms and upwards, in ſuch a manner as to meet and join that which is previouſly laid on the face: when the whole of the maſs has acquired its due hardneſs, it is to be cautiouſly lifted, without breaking or giving pain to the perſon. After the mould is conſtructed, it muſt be ſeaſoned in the manner already directed; and when the mould is caſt, it is to be ſeperated from the model by means of a ſmall mallet and chiſſel. The eyes, which are neceſſarily ſhown cloſed, are to be carved, ſo that the eye-lids may be repreſented in an elevated poſture; the noſtrils hollowed out, and the back part of the head, from which, on account of the hair, no mould can be taken, muſt be finiſhed according to the ſkill of the artiſt. The edges of the model are then to be neatly ſmoothed off and the buſt fixed on its pedeſtal.

5
Topographical models.

The method of making models in the plaſter of Paris is undoubtedly the moſt eaſy way of obtaining them. When models, however, are made of ſuch large objects that the model itſelf muſt be of conſiderable ſize, it is vain to attempt making it in the way above deſcribed. Such models muſt be conſtructed by the hand with ſome ſoft ſubſtance, as wax, clay, putty, &c. and it being neceſſary to keep all the proportions with mathematical exactneſs, the conſtruction of a ſingle model of this kind muſt be a work of great labour and expence as well as of time. Of all thoſe which have been undertaken by human induſtry, however, perhaps the moſt remarkable is that conſtructed by General Pfiffer, to repreſent the mountainous parts of Switzerland. It is compoſed of 142 compartments, of different ſizes and forms, reſpectively numbered, and ſo artfully put together, that they can be ſeparated and replaced with the greateſt eaſe. The model itſelf is 20½ feet long and 12 broad, and formed on a ſcale which repreſents two Engliſh miles and a quarter by an Engliſh foot; comprehending part of the cantons of Zug, Zurich, Schweitz, Underwalden, Lucerne, Berne, and a ſmall part of the mountains of Glarus; in all, an extent of country of 18½ leagues in length and 12 in breadth. The higheſt point of the model, from the level of the centre (which is the lake of Lucerne), is about ten inches; and as the moſt elevated mountain repreſented therein riſes 1475 toiſes or 9140 feet above the lake of Lucerne, at a groſs calculation, the height of an inch in the model is about 900 feet. The whole is painted of different colours, in ſuch a manner as to repreſent objects as they exiſt in nature; and ſo exactly is this done, that not only the woods of oak, beech, pine, and other trees, are diſtinguiſhed, but even the ſtrata of the ſeveral rocks are marked, each being ſhaped upon the ſpot, and formed of granite, gravel, or ſuch other ſubſtances as compoſe the natural mountain. So minute alſo is the accuracy of the plan, that it compriſes not only all the mountains, lakes, rivers, towns, villages, and foreſts, but every cottage, bridge, torrent, road, and even every path is diſtinctly marked.

The principal material employed in the conſtruction of this extraordinary model, is a mixture of charcoal, lime, clay, a little pitch, with a thin coat of wax; and is ſo hard that it may be trod upon without any damage. It was begun in the year 1766, at which time the general was about 50 years of age, and it employed him till the month of Auguſt 1785; during all which long ſpace of time he was employed in the moſt laborious and even dangerous taſks.—He raiſed the plans with his own hands on the ſpot, took the elevation of mountains, and laid them down in their ſeveral proportions. In the proſecution of this laborious employment he was twice arreſted for a ſpy; and in the popular cantons was frequently forced to work by moon-light, in order to avoid the jealouſy of the peaſants, who imagined that their liberty would be endangered ſhould a plan of their country be taken with ſuch minute exactneſs. Being obliged frequently to remain on the tops of ſome of the Alps, where no proviſions could be procured; he took along with him a few milk-goats, who ſupplied him with nouriſhment. When any part was finiſhed, he ſent for the people reſiding near the ſpot, and deſired them to examine each mountain with accuracy, whether it correſponded, as far as the ſmallneſs of the ſcale would admit, with its natural appearance; and then, by frequently retouching, corrected the deficiencies. Even after the model was finiſhed, he continued his Alpine expeditions with the ſame ardour as ever, and with a degree of vigour that would fatigue a much younger perſon. All his elevations were taken from the level of the lake of Lucerne; which, according to M. Sauſſure, is 1408 feet above the level of the Mediterranean.

MODENA, a duchy of Italy, bounded on the ſouth by Tuſcany and the republic of Lucca, on the north by the duchy of Mantua, on the eaſt by the Bologneſe and the territories of the church, and on the weſt by the duchy of Parma; extending in length from ſouth to north about 56 Engliſh miles, and in breadth between 24 and 36, and yielding plenty of corn, wine, and fruits, with mineral waters. In ſome places alſo petroleum is ſkimmed off the ſurface of the water of deep wells made on purpoſe; and in others is found a kind of earth or tophus, which, when pulveriſed, is ſaid to be an excellent remedy againſt poiſon, fevers, dyſenteries, and hypochondriac diſorders. The country of La Salſa affords ſeveral kinds of petrifactions. The principal rivers are the Croſtolo, Secchia, and Panaro. The family of Eſté, dukes of Modena, is very ancient. They had their name from Eſté, a ſmall city in the diſtrict of Padua. In 1753, the duke was appointed imperial vicar general, field-marſhal, and governor, of the Milaneſe during the minority of the archduke Peter Leopold, who was declared governor-general of the Auſtrian Lombardy. The duke, though a vaſſal of the empire, hath an unlimited power within his own dominions.

Modena, an ancient city, in Latin *Mutina*, which gives name to a duchy of Italy, and is its capital. It ſtands 28 miles eaſt of Parma, 44 almoſt ſouth of Mantua, and 20 weſt of Bologna; and is a pretty large and populous, but not a handſome city. It is much celebrated by Roman authors for its grandeur and opulence; but was a great ſufferer by the ſiege it underwent during the troubles of the triumvirate. It hath long been the uſual reſidence of the duke; and is alſo the ſee of a biſhop, who is ſuffragan to the archbiſhop of Bologna. Mr Keyſler ſays, that when Decius Brutus was beſieged here by Mark Antony, Hirtius the conſul made uſe of carrier-pigeons; and that, even at this day, pigeons are trained up at Modena to carry letters and bring back anſwers. This city hath given birth to ſeveral celebrated perſons, particularly Taſſo the poet, Correggio the great painter, Sigonius the civilian and hiſtorian, da Vignola the architect, and Montecuculi the imperial general. The tutelary ſaint of it is named *Geminianus.* The ducal palace is a very noble edifice, in which, among the other fine pictures, the birth of Chriſt by Correggio, called *la Natte Felice*, is much celebrated. The only manufacture for which this city is noted, is that of maſks, of which great numbers are exported. The churches of the Jeſuits, of the Theatines, and of St Dominic, are well worth viewing. In the college of St Carlo Boromeo between 70 and 80 young noblemen are continually maintained, and inſtructed both in the ſciences and genteel exerciſes. St Beatrix, who was of the family of Eſté, is ſaid to knock always at the gate of the palace three days before any of the family dies. Before moſt of the houſes are covered walks or porticos, as at Bologna. The city is fortified, and on its ſouth ſide ſtands the citadel.

MODERATION, in ethics, is a virtue conſiſting in the proper government of our appetites, paſſions, and purſuits, with reſpect to honours, riches, and pleaſures; and in this ſenſe it is ſynonymous with *temperance:* it is alſo often uſed to denote *candour.*

MODERATOR, in the ſchools, the perſon who preſides at a diſpute, or in a public aſſembly; thus the preſident of the annual aſſembly of the church of Scotland is ſtyled *moderator.*

MODERN, ſomething new, or of our time; in oppoſition to what is antique or *ancient.*

Modern Authors, according to Naude, are all thoſe who have wrote ſince Boethius. The modern philoſophy commences with Galileo; the modern aſtronomy with Copernicus.

MODESTY, in ethics, is ſometimes uſed to denote humility; and ſometimes to expreſs chaſtity, or purity of ſentiments and manners.—Modeſty, in this laſt ſenſe, and as particularly applied to women, is defined by the authors of the *Encyclopédie Methodique*, as a natural, chary, and honeſt ſhame; a ſecret fear; a feeling on account of what may be accompanied with diſgrace. Women who poſſeſs only the remains of a ſuſpicious modeſty, make but feeble efforts to reſiſt: thoſe who have obliterated every trace of modeſty from their countenance, ſoon extinguiſh it completely in their ſoul, and throw aſide for ever the veil of decency. She, on the contrary, who truly poſſeſſes modeſty, paſſes over in ſilence attempts againſt her honour, and forbears ſpeaking of thoſe from whom ſhe has received an outrage, when in doing ſo ſhe muſt reveal actions and expreſſions that might give alarm to virtue.

The idea of modeſty is not a chimera, a popular prejudice, or an illuſion ariſing from laws and education. Nature, which ſpeaks the ſame language to all men, has, with the unanimous conſent of nations, annexed contempt to female incontinence. To reſiſt and to attack are laws of her appointment: and while ſhe beſtows deſires on both parties, they are in the one accompanied with boldneſs, in the other with ſhame. To individuals ſhe has allotted long ſpaces of time for the purpoſes of ſelf-preſervation, and but moments for the propagation of their ſpecies. What arms more gentle than *Modeſty* could ſhe have put into the hands of that ſex which ſhe deſigned to make reſiſtance!

If it were the cuſtom for both ſexes to make and receive advances indiſcriminately, vain importunity would not be prevented: the fire of paſſion would never be ſtirred up, but languiſh in tedious liberty; the moſt amiable of all feelings would ſcarcely warm the human breaſt; its object would with difficulty be attained. That obſtacle which ſeems to remove this object to a diſtance, in fact brings it nearer. The veil of ſhame only makes the deſires more attractive. Modeſty kindles that flame which it endeavours to ſuppreſs: its fears, its evaſions, its caution, its timid avowals, its pleaſing and affecting fineſſes, ſpeak more plainly what it wiſhes to conceal, than paſſion can do without it: it is Modesty, in ſhort, which enhances the value of a favour, and mitigates the pain of a refuſal.

Since modeſty is the ſecret fear of ignominy; and ſince all nations, ancient or modern, have confeſſed the obligation of its laws; it muſt be abſurd to violate them in the puniſhment of crimes, which ſhould always have for its object the re-eſtabliſhment of order. Was it the intention of thoſe oriental nations, who expoſed women to elephants, trained for an abominable ſpecies of puniſhment, to violate one law by the obſervance of another? By an ancient practice among the Romans, a girl could not be put to death before ſhe was marriageable. Tiberius found means to evade this law by ordering them to be violated by the executioner previous to the infliction of puniſhment; the refinement of a cruel tyrant, who ſacrificed the morals to the cuſtoms of his people! When the legiſlature of Japan cauſed women to be expoſed naked in the market-places, and obliged them to walk on all-fours like brutes, modeſty was ſhocked: but when it wanted to force a mother—when it wanted to compel a ſon—nature received an outrage.

Such is the influence of climate in other countries, that the phyſical part of love poſſeſſes an almoſt irreſiſtible force. The reſiſtance is feeble; the attack is accompanied with a certainty of ſucceſs. This is the caſe at Patana, at Bantam, and in the ſmall kingdoms on the coaſt of Guinea. When the women in theſe countries (ſays Mr Smith) meet with a man, they lay hold of him, and threaten to inform their huſbands if he deſpiſes their favours. But here the ſexes ſeem to have aboliſhed the laws peculiar to each. It is fortunate to live in a temperate climate like ours, where that ſex which poſſeſſes the moſt powerful charms exerts them to embelliſh ſociety; and where modeſt women, while they reſerve themſelves for the pleaſures of one, contribute to the amuſement of all.

MODIFICATION, in philoſophy, that which modifies a thing, or gives it this or that manner of being. Quantity and quality are accidents which modify all bodies.

Decree of Modification, in Scots law, a decree aſcertaining the extent of a miniſter's ſtipend, without proportioning it among the perſons liable in payment.

MODILLIONS, in architecture, ornaments in the corniche of the Ionic, Corinthian, and Compoſite columns.

MODIUS, a Roman dry meaſure for all ſorts of grain, containing 32 heminæ, or 16 ſextarii, or one-third of the amphora, amounting to an Engliſh peck. See Measure.

MODREVIUS (Andreas Frichius), ſecretary to Sigiſmund Auguſtus king of Poland, acquired conſiderable reputation by his learning and works. He broke off from the Romiſh church, favoured the Lutherans and Anti-trinitarians, and took great pains in order to unite all Chriſtian ſocieties under the ſame communion. Grotius has placed him in the claſs of the reconcilers of the different ſchemes of religion. His principal work is intitled, *De republica emendanda.*

MODULATION, the art of forming any thing to certain proportion.

Modulation, in reading, or ſpeaking. See Reading.

Modulation, in muſic, derived from the Latin *modulari.* This word in our language is ſuſceptible of ſeveral different ſignifications. It frequently means no more than an air, or a number of muſical ſounds properly connected and arranged. Thus it anſwers to what Mr Malcolm underſtands by the word *tune*, when he does not expreſsly treat concerning the tuning of inſtruments. Thus likewiſe it expreſſes the French word *chant;* for which reaſon, in the article Music, we have frequently expreſſed the one word by the other, But the preciſe and technical acceptation to which it ought to be confined, is the art of compoſing melody or harmony agreeably to the laws preſcribed by any particular key, that of changing the key, or of regularly and legitimately paſſing from one key to another. In what remains to be ſaid upon the ſubject we follow Rouſſeau.

Modulation (ſays he) is properly the manner of aſcertaining and managing the modes; but at this time the word moſt frequently ſignifies the art of conducting the harmony and the air ſucceſſively through ſeveral modes, in a manner agreeable to the ear and conformed to rules.

If the different modes be produced by harmony, from thence likewiſe muſt ſpring the laws of modulation.

tion. Theſe laws are ſimple in conception, but difficult in practice. We proceed therefore to ſhew in what they conſiſt.

To modulate properly in the ſame tone, it is neceſſary, 1. To run through all the ſounds of it in an agreeable air, frequently repeating the ſounds which are moſt eſſential to it, and dwelling upon theſe ſounds with the moſt remarkable emphaſis; that is to ſay, that the chord containing the ſenſible notes, and that of the tonic, ſhould frequently be heard in it, but under different appearances, and obtained by different procedures to prevent monotony. 2. That repoſes or cadences ſhould only be eſtabliſhed upon theſe two chords: the greateſt liberty, however, which ought to be taken with the rule is, that a cadence or repoſe may be eſtabliſhed on the chord of the ſubdominant. 3. In ſhort, that none of the ſounds of the mode ought ever to be altered; for without quitting it we cannot introduce a ſharp or a flat which does not belong to it, nor abſtract any one which in reality does belong to it.

But paſſing from one mode to another, we muſt conſult analogy, we muſt conſider the relations which a key bears to the other notes in the ſeries, and to the number of ſounds common to both the modes, that from whence we paſs, and that into which we enter.

If we paſs from a mode major, whether we conſider the fifth from the key as having the moſt ſimple relation with it except that of the octave, or whether we conſider it as the firſt ſound which enters into the harmonics of the ſame key, we ſhall always find, that this fifth, which is the dominant of the mode, is the chord upon which we may eſtabliſh the modulation moſt analogous to that of the principal key.

This dominant, which conſtituted one of the harmonics of the firſt key, makes alſo one of its own peculiar key, of which it is the fundamental ſound. There is then a connection between theſe two chords. Beſides, that ſame dominant carrying, as well as the tonic, a perfect chord major upon the principle of reſonance, theſe two chords are only different one from the other by the diſſonance, which paſſing from the key to the dominant is the ſixth ſuperadded, and when reaſcending from the dominant to the key is the ſeventh. Now theſe two chords, thus diſtinguiſhed by the diſſonance which is ſuitable to each, by the ſounds which compoſe them when ranged in order, form preciſely the octave, or the diatonic ſcale, which we call a *gammut*, which determines the mode.

This ſame ſeries of the key, altered only by a ſharp, forms the ſcale belonging to the mode of the dominant; which ſhows how ſtriking the analogy is between theſe two tones, and gives the eaſieſt opportunity of paſſing from one to the other by means of one ſingle alteration alone. The mode then of the dominant is the firſt which preſents itſelf after that of the key in the order of modulations.

The ſame ſimplicity of relations which we find between a tonic and its dominant, is likewiſe found between the ſame tonic and its ſub-dominant: for that fifth, in aſcending, which is formed by the dominant with the tonic, is likewiſe formed by the ſub-dominant in deſcending: but that ſub-dominant does not form a fifth with the tonic, except by inverſion; it is directly a fourth, if we take that tonic below, as it ought to be; and which fixes the degrees of their relations: for in this ſenſe the fourth, whoſe ratio is as 3 to 4, immediately follows the fifth, whoſe ratio is as 2 to 3. So that, if that ſub-dominant does not enter into the chord of the tonic, in return the tonic enters into its perfect chord. For let *ut mi ſol* be the chord of the tonic, that of the ſub-dominant ſhall be *fa la ut*: thus it is the *ut* which here forms the connection, and the two other ſounds of this new chord, are exactly the two diſſonances of the preceding. Beſides, we need not alter more ſounds for this new mode than for that of the dominant; they are both in the one and the other quite the ſame chords of the principal mode, except one. And a flat to the ſenſible note *ſi* or B, and all the notes in the mode of *ut* or C will ſerve for that of *fa* or F. The mode of the ſub-dominant then is ſcarcely leſs analogous to the principal mode than that of the dominant.

It ought likewiſe to be remarked, that after having made uſe of the firſt modulation in order to paſs from a principal mode *ut* or C, to that of the dominant *ſol* or G, we are obliged to make uſe of the ſecond to return to the principal mode: for if *ſol* or G be the dominant in the mode of *ut* or C, *ut* is the ſub-dominant in the mode of *ſol*: thus one of theſe modulations is no leſs neceſſary than the other.

The third ſound which enters into the chord of the tonic is that of a third formed by its mediant; and after the preceding, it is likewiſe the moſt ſimple of relations $\frac{2\,3\,4}{3\,4\,5}$. Here then is a new modulation which preſents itſelf, and which is ſo much the more analogous, becauſe, two of the ſounds of the principal tonic enter likewiſe into the minor chord of its mediant: for the former chord being *ut mi ſol*, the latter muſt be *mi ſol ſi*, where it may be perceived that *mi* and *ſol* are common. But what renders this modulation a little more remote, is the number of ſounds which are neceſſary to be altered, even for the minor mode, which is moſt ſuitable to this *mi*. In the article MUSIC (234.) will be found a table for all the modes; and Rouſſeau, in his Muſical Dictionary, has given the formula of a ſcale both for the major and minor: now, by applying this formula to the minor mode, we find nothing in reality, but the fourth ſound *fa* heightened by a ſharp in aſcending; but in riſing, we find two others which are altered, *viz.* the principal tonic *ut*, and its ſecond *re*, which here becomes a ſenſible note: it is certain that the alteration of ſo many ſounds, and particularly of the tonic, muſt remove the mode and weaken the analogy.

If we ſhould invert the third as we have inverted the fifth, and take that third below the tonic on the ſixth note *la*, which ought here to be called a *ſub-mediant*, or the *mediant below*, we ſhall form upon this note *la* a modulation more analogous to the principal tone than that of *mi*; for as the perfect chord of this ſub-mediant is *la ut mi*, there once more we find, as in that of the mediant, two of the ſounds which enter into the chord of the tonic, *viz. ut* and *mi*: and moreover, ſince the ſcale of this new key is compoſed, at leaſt in deſcending, of the ſame ſounds with that of the principal key; and ſince it has only two ſounds altered in aſcending, that is to ſay, one fewer than the ſeries of the mediant; it follows that the modulation of this ſixth note is preferable to that of the mediant; and by ſo much the more, that there the principal tonic forms one of the ſounds eſſential to the mode; which is more proper for approximating the idea of the modulation. The *mi* may afterwards follow.

Here then are four ſounds, *mi fa ſol la*, upon each of which we may modulate in paſſing from the major mode of *ut*. *Re* and *ſi* remain, which are the two harmonics of the dominant. This laſt as being a ſenſible note, cannot become a tonic by any proper modulation, at leaſt it cannot immediately become one: this would be an abrupt application of ideas too much oppoſed to the ſame ſounds, and would likewiſe be to give it a harmony too remote from the principal ſound, As to the ſecond note *re*, we may likewiſe, by favour of a conſonant procedure in the fundamental baſe, modulate upon it in a third minor; but this muſt be only continued for an inſtant, that the audience may not have time to forget the modulation of *ut*, which is itſelf altered in that place; otherwiſe, inſtead of returning immediately to *ut*, we muſt paſs through intermediate modes, where we muſt run great hazard of deviation.

By following the ſame analogies, we may modulate in the following order, to make our exit from a minor mode; firſt upon the mediant, afterwards the dominant, next the ſub-dominant, then the ſub-mediant, or ſixth note. The mode of each of theſe acceſſory keys is determined by its mediant taken from the principal ſound. For inſtance, iſſuing from the major mode of *ut*, to modulate upon its mediant, we render the mode of that mediant minor; becauſe *ſol*, the dominant of the principal ſound, forms a third minor with that mediant, which is *mi*. On the contrary, in our egreſs from the minor mode of *la*, we modulate upon its mediant *ut* in the major mode; becauſe *mi*, the dominant of the tone from whence we iſſue, forms a third major with the key of that into which we enter, &c.

Theſe rules, comprehended in one general formula, import, that the modes of the dominant and of the ſub-dominant are like that of the tonic, and that the mediant and the ſixth note require a mode oppoſed. We muſt, however, remark, that, by the right which we have of paſſing from the major to the minor, and *vice verſa*, upon the ſame key, we may likewiſe change the order of modes from one key to another; but while we thus remove ourſelves from the natural modulation, we muſt preſently think of our return: for it is a general rule, that every piece of muſic ought to terminate in that key with which it began.

In his Medical Dictionary, plate B, fig. 6, and 7, Rouſſeau has collected in two examples which are very ſhort, all the modes to which we may immediately paſs; the firſt, in paſſing from the major mode; and the ſecond, from the minor. Each note indicates a particular modulation: and the value of the notes in each example likewiſe ſhows the relative duration ſuitable to each of theſe modes, according to its relation with the principal mode.

Theſe immediate tranſitions from one mode to another, furniſh us with the means of paſſing by the ſame rules to modes ſtill more remote, and from thence to return to the principal mode, of which we never ſhould leſe ſight. But it is not ſufficient to know what courſe we ought to purſue; we muſt likewiſe be acquainted with the method of entering into it. A ſummary therefore of the precepts which are given in this department ſhall immediately follow.

In melody, in order to diſcover and introduce the modulation which we have choſen, nothing is neceſſary but to render perceptible the alterations which it cauſes in the ſounds of that mode from whence we iſſue, to make them proper for the mode into which we enter. Are we now in the major mode of *ut?* there needs no more than to ſound the note *fa* ſharp, that we may diſcover the mode of the dominant; or a *ſi* flat, that we may ſhow the mode of the ſub-dominant. Afterwards you may run over the ſounds eſſential to the mode in which we enter: if it is well choſen, your modulation will always be juſt and regular.

In harmony, the difficulty is a little increaſed: for as it is neceſſary that the change of modes ſhould be made at the ſame time through all the parts, care muſt be taken of the harmony, and of the air, that we may avoid purſuing different modulations at the ſame time. Huygens has happily remarked, that the prohibition of two fifths in immediate ſucceſſion proceeds upon this rule as its principle; in reality, between two parts it is ſcarcely poſſible to form a number of juſt fifths in uninterrupted ſucceſſion without operating in two different modes.

To introduce a mode, a great many pretend that it is ſufficient to form the perfect chord of its principal ſound, and this is indiſpenſable in order to produce the mode. But it is certain, that the mode cannot be exactly determined but by the chord containing the ſenſible note, or the dominant: we muſt then cauſe this chord to be heard when we enter into a new modulation. The moſt eligible rule would be, That in it the ſeventh, or minor diſſonance, ſhould always be prepared, at leaſt the firſt time in which it is heard; but this method is not practicable in every admiſſible modulation: and provided that the fundamental baſis proceeds by conſonant intervals, that the connection of harmony be obſerved, the analogy of the mode purſued, and falſe relations avoided, the modulation will always be approved. Compoſers preſcribe as another rule, That a mode ſhould not be changed except after a perfect cadence; but this interdict is uſeleſs, and no perſon obſerves it.

All the poſſible methods of paſſing from one mode to another, are reducible to five with reſpect to the major mode, and to four with reſpect to the minor; which, in the Muſical Dictionary, plate B, fig. 8. will be found implied in a fundamental baſis intended for each modulation. If there be any other modulation which cannot be reſolved into ſome one of theſe nine, unleſs that modulation be enharmonic, it muſt infallibly be illegitimate, See Enharmonic.

MODULE, in architecture, a certain meaſure, or bigneſs, taken at pleaſure, for regulating the proportions of columns, and the ſymmetry or diſpoſition of the whole building. Architects generally chooſe the ſemidiameter of the bottom of the collumn for their module, and this they ſubdivide into parts or minutes.

MOEBIUS (Godfrey), profeſſor of phyſic at Iena, was born at Lauch in Thuringia in 1611. He became firſt phyſician to Frederic William elector of Brandenburg, to Auguſtus duke of Saxony, and to William duke of Saxe-Weimar. He wrote ſeveral medical works, which are eſteemed; and died at Halle, in Saxony, in 1664.

MOENIUS (Caius), a celebrated Roman conſul, conqueror of the ancient Latins, 358 B. C. He was the firſt who hung up the prows, &c. of the galleys he had taken at the naval engagement of Actium, upon the place where the tribunes harangued the people; from whence it was called the *roſtra*.

MŒONIA, or Mæonia. See Mæonia and Lydia.

MŒSIA, or Mysia, (anc. geog.) a country of Europe, extending from the confluence of the Savus and the Danube to the ſhores of the Euxine. It was divided into Upper and Lower Mœſia. Lower Mœſia was on the borders of the Euxine, and comprehended that tract of country which received the name of *Pontus* from its vicinity to the ſea. Upper Mœſia lay beyond the other, in the inland country.

MOFFAT, a village of Scotland, in the ſhire of Annandale, 50 miles ſouth-weſt of Edinburgh; famous for its ſulphureous well, which has been in juſt eſtimation for near 150 years as a remedy in all cutaneous and ſcrophulous complaints; and for its chalybeate ſpring, perhaps the ſtrongeſt in Britain, which was diſcovered about 45 years ago, and is of a very bracing quality.—The place is chiefly ſupported by the company who reſort thither for the benefit of its waters and air; but it has alſo a manufacture of coarſe woollen ſtuffs. It is a well-built clean village; and contains many good and even elegant lodgings, a tolerable aſſembly-room, a bowling-green and walks, and one of the beſt inns between London and Edinburgh.

MOFFETTA. See Ampsancti.

MOGODORE, or Mogadore, a large, uniform, and well-built town in the kingdom of Morocco, ſituated about 350 miles from Tangier on the Atlantic ocean, and ſurrounded on the land-ſide by deep and heavy ſands. The European factory here conſiſts of about a dozen mercantile houſes of different nations, whoſe owners, from the protection granted them by the emperor, live in full ſecurity from the Moors, whom indeed they keep at a rigid diſtance. They export, to America, mules; to Europe, Morocco leather, hides, gum arabic, gum ſandarac, oſtrich feathers, copper, wax, wool, elephant's teeth, fine mats, beautiful carpeting, dates, figs, raiſins, olives, almonds, oil, &c. In return, they import timber, artillery of all kinds, gunpowder, woollen cloths, linens, lead, iron in bars, all kinds of hardware and trinkets, ſuch as looking-glaſſes, ſnuff-boxes, watches, ſmall knives, &c. tea, ſugar, ſpices, and moſt of the uſeful articles which are not otherwiſe to be procured in this empire, The town is regularly fortified on the ſea-ſide; and on the land, batteries are ſo placed as to prevent any incurſion from the ſouthern Arabs, who are of a turbulent diſpoſition, and who, from the great wealth which is known to be always in Mogodore, would gladly avail themſelves of any opportunity that offered to pillage the town. The entrance, both by ſea and land, conſiſts of elegant ſtone arch-ways, with double gates. The market-place is handſomely built, with piazzas of the ſame materials; and at the water port there is a cuſtom-houſe and powder magazine, both of which are neat ſtone buildings. Beſides theſe public edifices, the emperor has a ſmall but handſome palace for his occaſional reſidence. The ſtreets of the town, though very narrow, are all in ſtraight lines; and the houſes, contrary to what we meet with in the other towns of the empire, are lofty and regular. The bay, which is little better than a road, and is very much expoſed when the wind is at north-weſt, is formed by a curve in the land, and a ſmall iſland about a quarter of a mile from the ſhore.—Its entrance is defended by a fort well furniſhed with guns.

Moguls.

MOGULS, a celebrated nation of Aſia, whoſe conqueſts formerly were the moſt rapid and extenſive of any people recorded in hiſtory. They themſelves deduce their origin from Japhet, or, as they call him, *Japhis*, the ſon of Noah. His ſon Turk, they ſay, was the firſt king, or khan, of thoſe nations who are now known by the ſeparate names of *Turks Tartars*, and *Moguls;* and the tartars eſpecially, aſſert that their proper deſignation is *Turks*. To this prince is attributed many of thoſe inventions which barbarous nations commonly aſcribe to their firſt ſovereigns. He was ſucceeded by Taunak; in whoſe reign the whole poſterity of Turk were divided into four large tribes, denominated the *orda's* of Erlat, Gialair, Kaugin, Berlas or Perlas; of which laſt came the famous Timur Beg, or Tamerlane.—From this time to that of Alanza Khan, we meet with nothing remarkable. In his reign the Turks being immerſed in all kinds of luxury, univerſally apoſtatized into idolatry. Having two ſons, Tartar and Mogul, he divided his dominions among them, and thus gave riſe to the two empires of the Tartars and Moguls.

1
Moguls deſcended from Japhet.

The two nations had not long exiſted before they began to make war upon each other, and after long contention, the event at laſt was, that Il Khan, emperor of the Moguls, was totally overthrown by Siuntz Khan, emperor of the Tartars: and ſo great was the defeat, that the Mogul nation ſeems to have been almoſt exterminated. Only two of Il Khan's family ſurvived this diſaſter. Theſe were Kajan his youngeſt ſon, and Nagos his nephew, who were both of an age, and had both been married the ſame year. Theſe two princes, with their wives, had been taken priſoners by Siuntz Khan, but found means to make their eſcape to their own country. Here they ſeized upon all the cattle which had not been carried off by the Tartars; which was eaſily done, as having none to diſpute about the property with them; then ſtripping ſome of the ſlain, they took their clothes, and retired into the mountains. They paſſed ſeveral mountains without much difficulty; but at laſt advanced to the foot of one exceedingly high, which had no way over it but a very ſmall path made by certain animals, called in the Tartar language, *archara*. This path they found themſelves obliged to make uſe of, though it was ſo ſtrait, that only one could paſs at a time, and he was in the moſt imminent danger of breaking his neck at the leaſt falſe ſtep.

2
Almoſt exterminated

Having

3
They arrive in a delightful valley.

Having aſcended the mountain on one ſide by this path, they deſcended by the ſame on the other ſide; and were agreeably ſurpriſed to find themſelves in a moſt delightful track, interſperſed with rivulets and charming meadows, abounding with a vaſt variety of delicious fruits, and incloſed on all ſides by inacceſſible mountains, in ſuch a manner as to ſhelter them from all future purſuits of the Tartars. Here they lived ſome time, and gave this beautiful country the name of *Irgana-kon*, in alluſion to its ſituation; *Irgana* ſignifying, in the old language of the Moguls, a "valley," and *Kon* a "ſteep height."

In proceſs of time theſe two families very much increaſed. Kajan, whoſe poſterity was the moſt numerous, called his deſcendants *Kajath:* but the people ſpringing from Nagos were divided into two tribes; one of which received the appellation of *Nagoller*, and the other that of *Durlagan.*

Theſe two Mogul princes and their deſcendants lived in this place for more than 400 years; but the latter then finding it too narrow for them, meditated a return to the country from which their forefathers had been driven. For ſome time, however, they found this impracticable, as the path that conducted their anceſtors had been long ſince deſtroyed. At laſt they diſcovered, that one part of the high mountain abovementioned was not very thick in a certain place; and alſo, that it conſiſted entirely of iron-ore. To this, having before ſet fire to a layer of wood, and another of charcoal, laid along the foot of the mountain, they applied 70 large bellows, and at laſt melted the mountain in ſuch a manner, that an opening was made large enough for a loaded camel to paſs; and through this paſſage they all marched out with great joy.

4
From whence they at laſt iſſue, and defeat the Tartars.

5
State of Aſia at the time of Jenghiz Khan.

The moguls having thus iſſued as it were from a new world, overthrew the Tartars in their turn; and continued to be a very conſiderable nation till the time of their great hero Temujin, afterwards called *Jenghiz Khan,* whom they extol in the moſt extravagant manner. It is difficult, however, to ſay, at the time Temujin made his appearance, how far the dominions of the Moguls extended, or in what eſtimation they were held by their neighbours. It ſeems to be pretty certain, that great part of the vaſt region now known by the name of *Tartary,* was then in a ſtate of conſiderable civilization, and likewiſe extremely populous, as we find mention made of many cities which the Moguls deſtroyed; and the incredible multitudes whom they ſlaughtered, abundantly ſhow the populouſneſs of the country. On the eaſt, the country of the Moguls and Tartars had the great deſart which divides Tartary from China; on the weſt, it had the empire of Karazm, founded by Mahmud Gazni; and on the ſouth were the countries now known by the name of *Indoſtan, Siam, Pegu, Tonquin,* and *Cochin-China.* Thus it comprehended the eaſtern part of modern Tartary, and all Siberia. This whole region was divided among a great number of *Amacks,* or *tribes;* who had each, one or more khans, according as it was more or leſs numerous, or divided into branches. Among theſe, that of the *Kara-its* was the moſt powerful; their prince aſſumed the title of *Grand Khan,* and among the reſt, the Moguls were tributary to him; but, according to the Chineſe hiſtorians, both the one and the other were tributary to the emperor of Kitay or Katay. China was divided into two parts; the nine ſouthern provinces were in the hands of the Chineſe emperors of the Song dynaſty, who kept their court at Hang-chew, the capital of the province of Check-yang; the five northern provinces, excepting part of Shenſi, were poſſeſſed by the Kin, a people of Eaſtern Tartary, from whom are deſcended the Manchew Tartars, at preſent maſters of China. This vaſt dominion was named *Kitay* or *Katay,* and was divided into two parts: that which belonged to China, was properly called *Kitay;* and the part which belonged to Tartary was called *Karakitay,* in which ſome even include the territories of the Moguls, Karaits, and other tribes, which are the ſubject of the preſent hiſtory. The weſtern part of the empire of Kitay was poſſeſſed by a Turkiſh prince, who had lately founded a new kingdom there, called *Hya;* whoſe capital city was Hyachew, now Ninghya in Shenſi, from whence the kingdom took its name. To the weſt of Hya lay Tangut; a country of great extent, and formerly very powerful; but at that time reduced to a low ſtate, and divided among many princes ſome of whom were ſubject to the emperor of Hya, and others to the emperor of China. All Tartary to the weſtward, as far as the Caſpian ſea, with the greater part of Little Buckharia, which then paſſed under the general name of *Turkeſtan,* was ſubject to Ghurkhan, Khurkhan, or Kavar Khan; to whom even the Gazni monarchs are ſaid to have been tributary. This Ghurkhan had been prince of the Weſtern Kitan or Lyau; who, driven out of Kitay by the king, ſettled in Little Buckharia and the country to the north, where they founded a powerful ſtate about the year 1124.

6
Deſcent and birth of Temujin.

Thus the Moguls, properly ſo called, had but a very ſmall extent of empire which could be called their own, if indeed they had any, when Temujin made his appearance. This hero is ſaid by the Tartars to have been of Divine origin, ſince his family could be traced no farther back than ten generations, the mother of whom was got with child by a ſpirit. The names and tranſactions of his predeceſſors are equally uncertain and unimportant: he himſelf however was born in the year 1163, and is ſaid to have come into the world with congealed blood in his hands; from whence it was prognoſticated that he would be a great warrior, and obtain the victory over all his enemies.

7
Subdues the revolted tribes by means of Vang Khan.

This prediction, if any ſuch there was, Temujin moſt literally fulfilled. At the time of his father's deceaſe, his ſubjects amounted to between 30,000 and 40,000 families; but of theſe two thirds quickly deſerted, and Temujin was left almoſt without ſubjects. When only 13 years of age he fought a bloody battle againſt theſe revolters; but either was defeated, or gained an indeciſive victory; ſo that he remained in obſcurity for 27 years longer. His good fortune at laſt he owed to the friendſhip of Vang Khan, who ruled over a great number of Tartar tribes to the north of Kitay, and has been heard of under the name of *Preſter John* among the Europeans. This prince took Temujin under his protection; and a rebellion being afterwards raiſed againſt him, Temujin was made his general, and the Khan was kept in poſſeſſion of his throne; ſoon after which, Temujin ſubdued the tribes which had revolted from himſelf, treating them at the ſame time with the utmoſt barbarity.

8
Who becomes jealous, and contrives his deſtruction.

This happened in the year 1201; but Vang Khan, inſtead of continuing the friend of Temujin, now became jealous, and reſolved to deſtroy him by treachery. With this view he propoſed a marriage between Temujin's ſon Juji and his own daughter, and another between Temujin's daughter and his own ſon. Temujin was invited to the camp of Vang Khan, in order to celebrate this double marriage; but, receiving intelligence of ſome evil intention againſt him, he excuſed himſelf to Vang Khan's meſſengers, and deſired that the ceremony might be put off to ſome other time.

A few days after the departure of theſe meſſengers, Badu and Kiſhlik, two brothers, who kept the horſes of one of Vang Khan's chief domeſtics, came and informed Temujin, that the grand Khan finding he had miſſed his aim, was reſolved to ſet out inſtantly, and ſurpriſe him next morning, before he could ſuſpect any danger. Temujin, alarmed at this intelligence, quitted his camp in the night-time, and retired with all his people to ſome diſtance. He was ſcarce gone when Vang Khan's troops arrived, and diſcharged an incredible number of arrows among the empty tents; but finding nobody there, they purſued Temujin in ſuch haſte that they fell into great diſorder. In this condition they were ſuddenly attacked and routed by Temujin; after which an open war with Vang Khan took place.

9
Temujin overcomes all his enemies.

By this quarrel almoſt all the princes of Tartary were put in motion, ſome ſiding with Temujin, and others with Vang Khan. But at laſt fortune declared in favour of the former: Vang Khan was overthrown in a battle, where he loſt 40,000 men; and obliged to fly for refuge to a prince named *Tayyan Khan*, who was Temujin's father-in-law, and his own enemy, and by whom he was ungenerouſly put to death. Temujin immediately began to ſeize on his dominions, great part of which voluntarily ſubmitted: but a confederacy was formed againſt him by a number of Vang Khan's tributaries, at the head of whom was Jamuka, a prince who had already diſtinguiſhed himſelf by his enmity to Temujin; and even Tayyan Khan himſelf was drawn into the plot, through jealouſy of his ſon-in-law's good fortune. But Temujin was well prepared; and in the year 1204 attacked Tayyan Khan, entirely routed his army, killed himſelf, and took Jemuka priſoner, whoſe head he cauſed inſtantly to be ſtruck off; after which he marched againſt the other tribes who had conſpired againſt him. Them he quickly reduced; took a city called *Kaſhin*, where he put all to the ſword who had borne arms againſt him; and reduced all the Mogul tribes in 1205.

Temujin now, having none to oppoſe him, called a general diet, which he appointed to be held on the firſt day of the ſpring 1206; that is, on the day in which the ſun entered Aries. To this diet were ſummoned all the great lords both Moguls and Tartars; and in the mean time to eſtabliſh good order in the army, he divided his ſoldiers into bodies of 10,000, 1000, 100, and 10 men, with their reſpective officers, all ſubordinate to the generals, or thoſe who commanded the bodies of 10,000; and theſe were to act under his own ſons. On the day of holding the diet, the princes of the blood and great lords appeared dreſſed in white. Temujin, dreſſed in the ſame manner, with his crown on his head, ſat down on his throne, and was complimented by the whole aſſembly, who wiſhed him the continuance of his health and proſperity. After this they confirmed the Mogul empire to him and his ſucceſſors, adding all thoſe kingdoms which he had ſubdued, the deſcendants of whoſe vanquiſhed khans were deprived of all right or title to them; and after this he was proclaimed emperor with much ceremony. During this inauguration, a pretended prophet declared that he came from God to tell the aſſembly, that from thenceforth Temujin ſhould aſſume the name of *Jenghiz Khan*, or *the Moſt Great Khan of khans*; prophecying alſo, that all his poſterity ſhould be khans from generation to generation. This prophecy, which was no doubt owing to Temujin himſelf, had a ſurpriſing effect on his ſubjects, who from that time concluded that all the world belonged of right to them, and even thought it a crime againſt heaven for any body to attempt to reſiſt them.

10
Aſſumes the title of Jenghis Khan.

Jenghiz Khan having now reduced under his ſubjection all the wandering tribes of Moguls and Tartars, began to think of reducing thoſe countries to the ſouth and ſouth weſt of his own, where the inhabitants were much more civilized than his own ſubjects; and the countries being full of fortified cities, he muſt of courſe expect to meet with more reſiſtance. He began with the emperor of Hya, whoſe dominions he invaded in 1209, who at laſt ſubmitted to become his tributary. But in the mean time Jenghis Khan himſelf was ſuppoſed to be tributary to the emperor of Kitay; who, in 1210, ſent him an officer, demanding the cuſtomary tribute. This was refuſed with the utmoſt indignation, and a war commenced, which ended not but with the diſſolution of the empire of Kitay, as mentioned under the article China.

11
Invades Hya, China, &c.

In the year 1216, Jenghis Khan reſolved to carry his arms weſtward, and therefore left his general Muchuli to purſue his conqueſts in Kitay. In his journey weſtward he overthrew an army of 300,000 Tartars who had revolted againſt him; and, in 1218, ſent ambaſſadors deſiring an alliance with Mohammed Karazm Shah, emperor of Gazna. His ambaſſador was haughtily treated: however, the alliance was concluded; but ſoon after broken through the treachery, as it is ſaid, of the Karazmian monarch's ſubjects. This brought on a war attended with the moſt dreadful devaſtations, and which ended with the entire deſtruction of the empire of Karazm or Gazna, as related under the article Gazna.

After the reduction of Karazm, part of the Moguls broke into Iran or Perſia, where alſo they made large conqueſts, while others of their armies invaded Georgia and the countries to the weſt; all this time committing ſuch enormities, that the Chineſe hiſtorians ſay both men and ſpirits burſt with indignation. In 1225, Jenghiz Khan returned to Hya, where he made war on the emperor for having ſheltered ſome of his enemies. The event was, that the emperor was ſlain, and his kingdom conquered, or rather deſtroyed; which, however, was the laſt exploit of this moſt cruel conqueror, who died in 1227, as he marched to complete the deſtruction of the Chineſe.

12
Vaſt extent of his empire.

The Mogul empire, at the death of Jenghiz Khan, extended over a prodigious tract of country; being more than 1800 leagues in length from eaſt to weſt, and upwards of 1000 in breadth from north to ſouth.

Its princes, however, were ſtill inſatiable, and puſhed on their conqueſts on all ſides. Oktay was acknowledged emperor after Jenghiz Khan and had under his immediate government Moguleſtan (the country of the Moguls properly ſo called), Kitay, and the countries eaſtward to the Tartarian ſea. Jagaty his brother governed under him a great part of the weſtern conqueſts. The country of the Kipjacks, and others to the eaſt and north-eaſt, north and north-weſt, were governed by Batu or Patu the ſon of Juji, who had been killed in the wars; while Tuli or Toley, another ſon of Jenghiz Khan, had Khoraſſan, Perſia, and what part of India was conquered. On the eaſt ſide the Mogul arms were ſtill attended with ſucceſs; not only the empire of Kitay, but the ſouthern part of CHIÑA, was conquered, as already related under that article n° 24—42. On the weſt ſide matters continued much in the ſame way till the year 1254, when Magu, or Menkho, the fourth khan of the Moguls, (the ſame who was afterwards killed at a ſiege in China*), raiſed a great army, which he gave to his brother Hulaku, or Hulagu, to extend his dominions weſtward. In 1255 he entered Iran, where he ſuppreſſed the Iſmaelians or Aſſaſſins, of whom an account is given under the article ASSASSINS; and two years afterwards he advanced to Bagdad, which he took, and cruelly put the khalif to death, treating the city with no more lenity than the Moguls uſually treated thoſe which fell into their hands. Every thing was put to fire and ſword; and in the city and its neighbourhood the number of ſlain, it is ſaid, amounted to 1,600,000. The next year he invaded Syria; the city of Damaſcus was delivered up, and, as it made no reſiſtance, the inhabitants were ſpared; but Aleppo being taken by ſtorm, a greater ſlaughter enſued there than had taken place at Bagdad, not even the children in their cradles being ſpared. Some cities of this country revolted the next year, or the year after; but falling again into the hands of the Moguls, they were plundered, and the inhabitants butchered without mercy, or carried into ſlavery.

13
Bagdad reduced.

Hulaku died in 1264, and at his death we may fix the greateſt extent of the Mogul empire. It now comprehended the whole of the continent of Aſia excepting part of Indoſtan, Siam, Pegu, Cochinchina and a few of the countries of Leſſer Aſia, which had not been attacked by them; and during all theſe vaſt conqueſts no Mogul army had ever been conquered, except one by Jalolodin, as mentioned under the article GAZNA.—From this period, however, the empire began to decline. The ambition of the khans having prompted them to invade the kingdoms of Japan and Cochinchina, they were miſerably diſappointed in their attempts, and loſt a great number of men. The ſame bad ſucceſs attended them in Indoſtan; and in a ſhort time this mighty empire broke into ſeveral ſmaller ones. The governors of Perſia being of the family of Jenghiz Khan, owned no allegiance to any ſuperior; thoſe of Tartary did the ſame. The Chineſe threw off the yoke: and thus the continent of Aſia wore much the ſame face that it had done before Jenghiz Khan began his conqueſts.

14
It begins to decline.

The ſucceſſors of Hulaku reigned in Perſia till the year 1335; but that year Abuſaid Khan, the eighth from Hulaku, dying, the affairs of that country fell into confuſion for want of a prince of the race of Jenghiz Khan to ſucceed to the throne. The empire, therefore was divided among a great number of petty pinces, who fought againſt each other almoſt without intermiſſion, till, in the year 1369, Timur Bek, or Tamerlane, one of theſe princes, having conquered a number of others, was crowned at Balkh, with the pompous title of *Saheb Karan*; that is, "the emperor of the age, and conqueror of the world." As he had juſt before taken that city, and deſtroyed one of his moſt formidable rivals who had ſhut himſelf up in it, the new emperor began his reign with beheading ſome of the inhabitants, impriſoning others, burning their houſes, and ſelling the women and children for ſlaves. In 1370 he croſſed the Sihun, made war on the Getes, and attacked Karazm. Next year he granted a peace to his enemies; but two years after, he again invaded the country of the Getes, and by the year 1379 had fully conquered the country as well as Korazan; and from that time he continued to extend his conqueſts in much the ſame manner as Jenghiz Khan had done, though with leſs cruelty.—In 1387 he had reduced Armenia, Georgia, and all Perſia; the conqueſt of which laſt was completed by the reduction of Iſpahan, 70,000 of the inhabitants of which were ſlaughtered on account of a ſedition raiſed by ſome raſh or evil diſpoſed perſons.

15
Tamerlane crowned emperor of Balkh.

16
Becomes a great conqueror.

After the reduction of Perſia, Timur turned his arms northward and weſtward, ſubduing all the countries to the Euphrates. He took the city of Bagdad; ſubdued Syria; and having ravaged great part of Ruſſia, returned to Perſia in 1396, where he ſplendidly feaſted his whole army. In 1398 he invaded Indoſtan, croſſed the Indus on the 17th of September, reduced ſeveral fortreſſes, and made a vaſt number of captives. However, as he was afraid that, in caſe of any emergency, theſe priſoners might take part with the enemy, he gave orders to his ſoldiers to put all their Indian ſlaves to death; and, in conſequence of this inhuman order, more than 100,000 of theſe poor wretches were ſlaughtered in leſs than an hour.

17
Invades and conquers Indoſtan.

In the beginning of the year 1399, Timur was met by the Indian army; whom, after a deſperate battle, he defeated with great ſlaughter, and ſoon after took the city of Delhi, the capital of the country. Here he ſeated himſelf on the throne of the Indian emperors, and here the ſharifs, kadis, and principal inhabitans of the city, came to make their ſubmiſſion, and begged for mercy. The tame elephants and rhinoceroſes likewiſe were brought to kneel before him as they had been accuſtomed to do to the Indian emperors, and made a great cry as if they implored his clemency. Theſe war elephants, 120 in number, were, at his return, ſent to Samarcand, and to the province where his ſons reſided. After this, at the requeſt of the lords of the court, Timur made a great feaſt, at which he diſtributed preſents to the princes and principal officers.

Delhi at this time conſiſted of three cities, called *Seyri*, *Old Delhi*, and *Jehan Penah*. Seyri was ſurrounded with a wall in form of a circle. Old Delhi was the ſame, but much larger, lying ſouth-weſt of the other. Theſe two parts were joined on each ſide by a wall; and the third, lying between them, was called *Jehan Penah*, which was larger than Old Delhi. Penah

18
The city of Delhi deſtroyed, and the inhabitants ſlaughtered.

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* See China, n° 38.

nah had ten gates; Seyri had ſeven, three of which looked towards Jehan Penah; this laſt had thirteen gates, ſix to the north-weſt, and ſeven to the ſouth eaſt. Every thing ſeemed to be in a quiet poſture, when on the 12th of January 1399, the ſoldiers of Timur being aſſembled at one of the gates of Dehli, inſulted the inhabitants of the ſuburbs. The great emirs were ordered to put a ſtop to theſe diſorders; but their endeavours were not effectual. The ſoltanas having a curioſity to ſee the rarities of Dehli, and particularly a famous palace adorned with 1000 pillars, built by an ancient king of India, went in with all the court; and the gate being on that occaſion left open for every body, above 15,000 ſoldiers got in unperceived. But there was a far greater number of troops in a large place between Dehli, Seyri, and Jehan Penah, who committed great diſorders in the two laſt cities. This made the inhabitants in deſpair fall on them; and many, ſetting fire to their houſes, burnt their wives and children. The ſoldiers ſeeing this confuſion did nothing but pillage the houſes; while the diſorder was increaſed by the admiſſion of more troops, who ſeized the inhabitants of the neighbouring places who had fled thither for ſhelter. The emirs, to put a ſtop to this miſchief, cauſed the gates to be ſhut: but they were quickly opened by the ſoldiers within, who roſe in arms againſt their officers; ſo that by the morning of the 13th the whole army was entered, and this great city was totally deſtroyed. Some ſoldiers carried out 150 ſlaves, men, women, and children, nay, ſome of their boys had 20 ſlaves a piece to their ſhare. The other ſpoils, in jewels, plate and manufactures, were immenſe; for the Indian women and girls were adorned with precious ſtones, and had bracelets and rings on their hands, feet and even toes, ſo that the ſoldiers were loaded with them. On the 15th, in old Dehli, the Indians retired into the great moſque to defend themſelves; but being attacked by the Tartars, they were all ſlaughtered, and towers erected with their heads. A dreadful carnage now enſued throughout the whole city, and ſeveral days were employed before the inhabitants could be made to quit it entirely; and as they went, the emirs took a number of them for their ſervice. The artiſans were alſo diſtributed among the princes and commanders; all but the maſons, who were reſerved for the emperor, in order to build him a ſpacious ſtone-moſque at Samarcand.

After this terrible devaſtation, Timur marched into the different provinces of Indoſtan, every where defeating the Indians who oppoſed him, and ſlaughtering the Ghebrs or worſhippers of fire. On the 25th of March he ſet out on his return, and on the 9th of May arrived at Samarcand. In a few months after his arrival, he was obliged to undertake an expedition into Perſia, where affairs were in the utmoſt diſorder on account of the miſconduct of his ſon, whom he had appointed ſovereign of that empire Here Timur ſoon ſettled matters; after which he again ſet out on an expedition weſtward, reduced many places in Georgia which had not ſubmitted before, and invaded and conquered Syria. At the ſame time he quarrelled with Bajazet the Turkiſh ſultan, then buſied in an enterpriſe againſt Conſtantinople, in which he would probably have ſucceeded had not Timur interpoſed.

19
Timur quarrels with Bajazet the Turkiſh ſultan.

The cauſe of this quarrel on his ſide was, that Bajazet had demanded tribute from a prince who was under Timur's protection, and is ſaid to have returned an inſulting anſwer to the Tartar ambaſſadors who were ſent to him on that account. Timur, however, who was an enthuſiaſt in the cauſe of Mahometaniſm, and conſidered Bajazet as engaged in the cauſe of heaven when beſieging a Chriſtian city, was very unwilling to diſturb him in ſo pious a work; and therefore undertook ſeveral expeditions againſt the princes of Syria and Georgia, in order to give the Turkiſh monarch time to cool and return to reaſon. Among other places, he again inveſted the city of Bagdad which had caſt off its allegiance to him; and having taken it by ſtorm, made ſuch a dreadful maſſacre of the inhabitants, that 120 towers were erected with the heads of the ſlain. In the mean time Bajazet continued to give freſh provocation, by protecting one Kara Yuſef a robber, who had even inſulted the caravan of Mecca; ſo that Timur at length reſolved to make war upon him. The ſultan, however, foreſeeing the danger of bringing ſuch a formidable enemy againſt himſelf, thought proper to aſk pardon, by a letter, for what was paſt, and promiſe obedience to Timur's will for the future. This embaſſy was graciouſly received; and Timur returned for anſwer, that he would forbear hoſtilities, provided Bajazet would either put Kara Yuſef to death, ſend him to the Tartar camp, or expel him out of his dominions. Along with the Turkiſh ambaſſadors he ſent one of his own; telling Bajazet that he would march into the confines of Anatolia, and there wait his final anſwer.

Though Bajazet had ſeemed at firſt willing to come to an agreement with Timur, and to dread his ſuperior power; yet he now behaved in ſuch an unſatisfactory manner, that the Tartar monarch deſired him to prepare for war; upon which he raiſed the ſiege of Conſtantinople, and having met Timur with an army greatly inferior to the Tartars, was utterly defeated and taken priſoner. According to ſome accounts, he was treated with great humanity and honour; while others inform us, that he was ſhut up in an iron cage, againſt which he daſhed out his brains the following year. At any rate, it is certain that he was not reſtored to liberty, but died in confinement.

20
Bajazet defeated and taken priſoner.

This victory was followed by the ſubmiſſion of many places of the Leſſer Aſia to Timur; the Greek emperor owned himſelf his tributary, as did alſo the ſultan of Egypt. After this Timur once more returned to Georgia, which he cruelly ravaged; after which he marched to Samarcand, where he arrived in the year 1405. Here, being now an old man, this mighty conqueror began to look forward to that ſtate which at one time or other is the dread of all living creatures; and Timur, in order to quiet the remorſes of his own conſcience, came to the following curious reſolution, which he communicated to his intimate friends namely, that "as the vaſt conqueſts he had made were not obtained without *ſome violence*, which had occaſioned the deſtruction of a great number of God's creatures, he was reſolved, by way of atonement for his paſt crimes, to perform ſome good action; namely, to make war on the infidels, and exterminate the idolaters of China." This atonement however, he did not live to accompliſh; for he died the ſame year

21
Death of Tamerlane, and diſſolution of his empire.

year of a burning fever, in the 71ſt year of his age and 36th of his reign.

On the death of Timur, his empire fell immediately into great diſorder, and the civil wars continued for five or ſix years; but at laſt peace was reſtored, by the ſettlement of Shah Rukh, Timur's ſon, on the throne. He did not, however, enjoy the empire in its full extent, or indeed much above one half of it; having only Karazm, Khoraſſan, Kandahar, Perſia, and part of Indoſtan. Neither was he able, though a brave and warlike prince, to extend his dominions, though he tranſmitted them to his ſon Ulug Beg. He proved a wiſe and learned monarch; and is famous for the aſtronomical tables which he cauſed to be compoſed, and which are well known at this day. He was killed in 1448 by his ſon Abdollatif, who ſix months after was put to death by his own ſoldiers. After the death of Abdollatif, Abdollah, a grandſon of Shah Rukh, ſeized the throne; but, after reigning one year, was expelled by Abuſaid Mirza, the grandſon of Miran Shah the ſon of Timur. His reign was one continued ſcene of wars and tumults; till at laſt he was defeated and taken priſoner by one Haſſan Beg, who put him to death in 1468. From this time we may look upon the empire of Timur as entirely diſſolved, though his deſcendants ſtill reigned in Perſia and Indoſtan, the latter of which is ſtill known by the name of the *Mogul's empire*.

22
History of Indoſtan.

On the death of the abovementioned monarch, his ſon Babr or Babor ſucceeded him, but was ſoon driven out by the Uſbeck Tartars; after which he reſided ſome time in Gazna, whence he made incurſions into Hindoſtan, and at length became maſter of the whole empire, excepting the kingdoms of Dekan, Guzerat, and Bengal. For the tranſactions ſubſequent to this period, ſee the articles HINDOSTAN and INDIA. What remains to be ſupplied here is an account of the revolution that has lately happened at Delhi the capital of the Mogul empire.

Gholam Khadur, author of the revolution, was the ſon of Zabda Khan. His father diſinherited him, and drove him from his preſence on account of his vices and his crimes. Shah Allum, the king of Delhi, took him under his protection, treated him as his own ſon, and conferred on him the firſt title in the kingdom, Amere ul Omraow. He lived with the king, and raiſed a body of about 8000 troops of his own countrymen the Moguls, which he commanded. Gholam Khadur was of a paſſionate temper, haughty, cruel, ungrateful, and debauched. In the latter end of the year 1788, the king had formed ſuſpicions that ſome of the neighbouring rajahs (princes) would make an attempt to plunder and deſtroy his territories. Theſe ſuſpicions were verified by the approach of a conſiderable army towards his capital, commanded by Iſmael Beg Khan, and aſſiſted by Scindia. Gholam Khadur told the king on this, that he had nothing to fear; for that he had an army ſufficiently ſtrong to oppoſe the enemy: that all the king had to do was to march out with his troops, give them a ſupply of caſh, and he would lay his head on the enemy's being overcome. The king on this replied, that he had no money to carry on a conteſt. Gholam Khadur ſaid, that this objection would ſoon be obviated, as he (Gholam Khadur) would advance the neceſſary ſupply of caſh, and that all his majeſty had to do was to head the army. "This (ſaid he) will animate them and give them confidence; the preſence of a monarch is above half the battle." The king agreed in appearance, and requeſted Gholam Khadur to aſſemble the army, pay their arrears, and inform them of his intentions. Gholam Khadur retired contented: but great was his aſtoniſhment, when he intercepted the next day a letter from the king to Scindia, deſiring him to make as much haſte as poſſible, and deſtroy Gholam Khadur; for, ſays he, Khadur wiſhes me to act contrary to my wiſhes, and oppoſe you. On this diſcovery, Gholam Khadur marched out with his Moguls, croſſed the Jumna, and encamped on the other ſide oppoſite the fort of Delhi. He ſent to the king the intercepted letter, and aſked him if his conduct did not deſerve to be puniſhed by the loſs of his throne? He began to beſiege the fort, and carried it in a few days. He entered the palace in arms; flew to the king's chamber; inſulted the old man in the moſt barbarous manner; knocked him down, and, kneeling on his breaſt, with his knife took out one of his eyes, and he ordered a ſervant of the king's to take out the other.

After this he gave up the palace to pillage, and went to the king's zazana (the reſidence of his women); where he inſulted the ladies, and tore their jewels from their noſes and ears, and off their arms and legs. As he had lived with the king, he was well acquainted with the different places where the king's treaſures were hid; he dug up the floor of the king's own bed-room, and found there two cheſts, containing in ſpecie 120,000 gold mohurs, or L. 192,000 ſterling; this he took, and vaſt ſums more. To get at the hidden jewels of the women, he practiſed one of the moſt villainous ſchemes that ever was thought of. The third day after theſe horrid cruelties, he ordered that all the king's ladies and daughters ſhould come and pay their reſpects to him, and promiſed to ſet thoſe free who could pleaſe him by their appearance and dreſs. The innocent, unthinking women, brought out their jewels, and adorned themſelves in their richeſt attire to pleaſe this ſavage. Gholam Khadur commanded them to be conveyed into a hall, where he had prepared common dreſſes for them; theſe dreſſes he made them put on by the aſſiſtance of eunuchs; and taking poſſeſſion of their rich dreſſes and jewels, ſent the women home to the palace to lament their loſs and curſe his treachery. Gholam Khadur did not even ſtop here; but inſulted the princeſſes, by making them dance and ſing. The moſt beautiful of the king's daughters, Mobaruck ul Moulk, was brought to this tyrant to gratify his luſt: but ſhe reſiſted, and is ſaid to have ſtabbed herſelf in order to avoid force.

Scindia ſoon after this came to the aſſiſtance of the king, rather to make him his prey. Gholam Khadur fled and took refuge in the fort of Agra, a large city about 150 miles from Delhi. Scindia's troops beſieged him there. Perceiving at laſt that he muſt be taken if he continued in the fort, he took the advantage of a dark night, ſtuffed his ſaddle with a large ſtock of precious ſtones, took a few followers, and fled from the fort towards Perſia. Unluckily for him, he fell off his horſe the ſecond night after his flight; by

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this means a party of horſe which had been ſent in purſuit of him came up with him, and took him priſoner. He was brought to Scindia; who, after expoſing him for ſome time in irons, and ſome time in a cage, ordered his ears, his noſe, his hands, and his feet, to be cut off, and his eyes taken out; in which ſtate he was allowed to expire.

Scindia has rewarded himſelf by ſeizing upon the kingdom which he came to guard: And all that now belongs to Shah Allum, the nominal emperor, is the city of Delhi, with a ſmall diſtrict around it, where, even deprived of ſight, he remains an empty ſhadow of royalty; an inſtance of the inſtability of human greatneſs, and of the precarious ſtate of deſpotic governments.

MOHAIR, in commerce, the hair of a kind of goat frequent about Angria in Turkey; the inhabitants of which city are all employed in the manufacture of camblets made of this hair.

Some give the name *mohair* to the camblets or ſtuffs made of this hair: of theſe there are two kinds; the one ſmooth and plain, the other watered like tabbies: the difference between the two only conſiſts in this, that the latter is calendered, the other not. There are alſo mohairs both plain and watered, whoſe woof is of wool, cotton, or thread.

Mohair-Shell, in conchyliology, a name given to a peculiar ſpecies of voluta, which ſeems of a cloſely and finely reticulated texture, and reſembles on the ſurface a piece of mohair or a very cloſe ſilk-worm's web.

MOHAWKS. See Muck.

Mohawk-Country, a part of North America, inhabited by one of the five nations of the Iroquois, ſituated between the ſtate of New York and the lake Ontario or Frontignac.

MOHILA, or Moelia, one of the Comorra iſlands in the Indian ſea, between the north end of the iſland of Madagaſcar and the continent of Africa. The inland parts are mountainous and woody; but the lands adjoining to the ſea are watered by ſeveral fine ſtreams which deſcend from the mountains; and the graſs is green all the year, ſo that it affords a moſt delightful habitation. There are plenty of proviſions of all kinds; and the Eaſt India ſhips of different nations ſometimes touch here for refreſhment.

MOHILOF, a large and ſtrong city of Poland, in the province of Lithuania, and palatinate of Mſciſlau. It is well built, populous, and has a conſiderable trade. Near this place the Swedes obtained a great victory over the Ruſſians in 1707.

MOIDORE, a Portugueſe gold coin, value 1l. 7s. Sterling.

MOIETY *(Medietas)*, the half of any thing.

MOINE (Peter le), was born at Chaumont in Baſſigni, A. D. 1602, and died at Paris Auguſt 22, 1672, aged 70. He joined the ſociety of Jeſuits, and enjoyed ſeveral offices among them. He is chiefly known by his verſes, which were collected into one volume folio in 1671. Father le Moine is the firſt of the French poets belonging to that famous ſociety, who acquired reputation by this ſpecies of writing. It cannot be denied that this poet poſſeſſed genius and fancy; but his imagination was ungoverned, which is particularly the caſe in his poem of *Saint Louis*. Deſpreaux, when aſked his opinion of this poet, replied, That "he was too extravagant for praiſe, and too much a poet for cenſure." To give his character in one word, he was a pedant who had a lively imagination without taſte, and who, far from reſtraining his impetuous genius, abandoned himſelf without reſerve to its direction. Hence his gigantic figures, his crowd of metaphors, his ridiculous antitheſes, his hyperbolical expreſſions, &c. This Jeſuit ſomewhere ſays, "that the water of the river on the banks of which he had compoſed his verſes, was ſo admirably qualified to make poets, that though it were converted into holy water, it would not protect a man againſt the dæmon of poetry." The proſe of Father le Moine is in the ſame briliant and bombaſtic ſtyle. Senault, a father of the oratory, uſed to ſay of him, that he was "Balzac in a theatrical dreſs." Among his proſe works are, 1. *La Devotion aiſée*, Paris, 1652, 8vo; an extraordinary book which produced more mirth than devotion. 2. *Penſées Morales*. On theſe two books the reader may conſult Paſchal's ninth and tenth provincial letters. 3. A ſhort treatiſe on Hiſtory, in 12mo; in which we find many pleaſant and curious thoughts mixed with a good deal of common-place.

Moine, (Stephen le), a very learned French miniſter of the Proteſtant religion, was born at Caen in 1624. He became extremely ſkilled in the Greek, Latin, and Oriental tongues, and profeſſed divinity with high reputation at Leyden, in which city he died in 1689. Several Diſſertations of his are printed together, and intituled *Varia Sacra*, in 2 vols. 4to; Beſides which, he wrote other works.

Moine (Francis le), an excellent French painter, was born at Paris in 1688, and trained up under Galloche profeſſor of the academy of painting; which office he himſelf afterwards filled. Le Moine painted the grand ſaloon which is at the entrance into the apartments of Verſailles, and which repreſents the apotheoſis of Hercules. He was four years about it; and the king, to ſhow how well pleaſed he was with it, made him his firſt painter in 1736, and gave him a penſion of 4000 livres. A fit of lunacy ſeized this painter the year after; during which he run himſelf through with his ſword, and died June 4, 1737, aged 49.

MOIRA (ſometimes written *Moyra)*, a town of Ireland, ſituated in the county of Down and province of Ulſter, 69 miles from Dublin; noted for its linen manufacture, and a monthly market for vending the ſame. It gives title of earl to the family of Rawdon. Lord Moira has here a very beautiful ſeat; and here is a handſome church, a charity ſchool, and two diſſenting-meeting-houſes.

MOISTURE. See Humidity.

The moiſture of the air has conſiderable effects on the human body. For the quantity and quality of the food, and the proportion of the meat to the drink, being given, the weight of a human body is leſs, and conſequently its diſcharges greater in dry weather than in wet weather; which may be thus accounted for: the moiſture of the air moiſtens the fibres of the ſkin and leſſens perſpiration by leſſening their vibratory motion. When perſpiration is thus leſſened by the moiſture of the air, urine indeed is by degrees

Moivre. increaſed, but not equally. Hence, according to Dr Bryan Robinſon, we learn, that to keep a body of the ſame weight in wet weather as in dry, either the quantity of food muſt be leſſened, or the proportion of the meat to the drink increaſed; and both theſe may be done by leſſening the drink without making any change in the meat.

The inſtrument uſed for determining the degree of moiſture in the air, is called an *hygrometer*. See Hygrometer.

MOIVRE (Abraham), was born at Vitri in Champagne, A. D. 1667. His father was a ſurgeon. At the revocation of the edict of Nantes, he determined to fly into England rather than abandon the religion of his fathers. Before he left France, he had begun the ſtudy of Mathematics; and having perfected himſelf in that ſcience in London, he was obliged, by the meanneſs of his circumſtances, to teach it. Newton's *principia*, which accidentally fell into his hands, ſhowed him how little progreſs he had made in a ſcience of which he thought himſelf maſter. From this work he acquired a knowledge of the geometry of infinites with as great facility as he had learned the elementary geometry; and in a ſhort time he was fit to be ranked with the moſt celebrated mathematicians. His ſucceſs in theſe ſtudies procured him a ſeat in the Royal Society of London and in the Academy of Sciences at Paris. His merit was ſo well underſtood in the former, that he was thought capable of deciding in the famous diſpute between Leibnitz and Newton concerning the differential calculus. —He publiſhed a Treatiſe on Chances in 1738, and another on annuities in 1732; both extremely accurate. The Philoſophical Tranſactions contain many intereſting memoirs of his compoſition.— Some of them treat of the method of fluxions; others are on the lunula of Hippocrates; others on phyſical aſtronomy, in which he reſolved many important problems; and others, in ſhort, on the analyſis of the games of chance, in which he followed a different courſe from that of Montmort. Towards the cloſe of his life he loſt his ſight and hearing; and the demand for ſleep became ſo great that he required 20 hours of it in a day. He died at London, 1754, aged 87. His knowledge was not confined to mathematics; but he retained to the laſt a taſte for polite literature. He was intimately acquainted with the beſt authors of antiquity; and he was frequently conſulted about difficult paſſages in their works. Rabelais and Moliere were his favourite French authors; he had them by heart: and he one day obſerved to one of his acquaintance, "that he would rather have been Moliere than Newton." He recited whole ſcenes of the *Miſanthrope* with that delicacy and force with which he remembered to have heard them recited at Paris 70 years before, by Moliere's own company. The character indeed was ſomewhat ſimilar to his own. He judged ſeverely of mankind; and could never conceal his diſguſt at the converſation of a fool, nor his averſion to cunning and diſſimulation. He was free from the affectation of ſcience; and no one could know him to be a mathematician but from the accuracy of his thoughts. His converſation was general and inſtructive. Whatever he ſaid was well digeſted and clearly expreſſed. His ſtyle poſſeſſed more ſtrength and ſolidity than ornament and animation; but he was always correct, as he beſtowed as much pains on his ſentences as on his calculations. He could never endure any bold aſſertions or indecent witticiſms againſt religion. "I ſhow you that I am a Chriſtian (ſaid he one day to a perſon who thought to pay him a compliment by obſerving that mathematicians were attached to no religion), by forgiving the ſpeech you have now made." The practice of giving vails to ſervants was not laid aſide in his time; and, on this account, when a nobleman aſked him why he did not dine oftener with him? "You muſt excuſe me, my lord (replied he), I cannot afford it."

Mola ‖ Moldavia.

MOLA (Pietro Franciſco), an eminent painter, was born, according to moſt authors, at Lugano, a city belonging to the Switzers, in the year 1609. Others affirm, that the place of his birth was Coldra, in the diſtrict of Como. He was at firſt the diſciple of Giuſeppe d'Arpino, and afterwards of Albano. When he quitted the ſchool of the latter, he went to Venice, and ſtudied aſſiduouſly the pictures of Titian. Tintoretto, Baſan, and Paolo Veroneſe. He painted hiſtorical ſubjects and landſcapes with great ſucceſs; but his genius ſeemed more particularly adapted to the latter. His pictures, in both ſtyles, are ſpoken of with the warmeſt commendations. He died in 1665.—He had a brother, *Giovanna Batiſta*, who was alſo a painter, and of ſome merit, but very inferior to that of the older.

Mola, an ancient town of Italy, in the kingdom of Naples, and in the Terra di Lavoro, where they pretend to ſhow the ruins of Cicero's houſe. It is ſeated on the gulph of Venice, in E. Long. 17. 50. N. Lat. 41. 5.

Mola Salſa (*Salt Cake*), in antiquity, was barley parched, and afterwards ground to meal or flour, then mixed with ſalt and frankincenſe, with the addition of a little water. Thus prepared, it was ſprinkled between the horns of the victim before it was killed in ſacrifice. This act was called *immolatio*, and was common to the Greeks as well as Romans; with this difference, that the *mola* of the Romans was of wheat. The Greeks called it ουλη or ουλοχυτη.

MOLARES, or Dentes molares, in anatomy, the large teeth, called in Engliſh the *grinders*. See Anatomy, n° 27.

MOLASSES, or Molosses. See Molosses.

MOLDAVIA, a province of Turkey in Europe, bounded on the north-eaſt by the river Nieſter, which divides it from Poland; on the eaſt, by Beſſarabia; on the ſouth by the Danube, which parts it from Bulgaria; and on the weſt, by Walachia and Tranſylvania: it being 240 miles in length and 150 in breadth. It lies in a good air and fruitful ſoil, producing corn, wine, rich paſtures, a good breed of horſes, oxen, ſheep, plenty of game, fiſh, fowl, honey, wax, and all European fruits. Its principal rivers are the Danube, Nieſter, Pruth, Bardalach, and Ceret. The inhabitants are Chriſtians of the Greek church, and Jaſſy is the principal town. It has been tributary to the Turks ever ſince the year 1574; who appoint a prince who is a native of the country, but have no regard to his being of the principal families. They pay a large yearly tribute, beſides which, they are obliged to raiſe a great body of horſe at their own expence.

MOLE, a river in Surry, which has taken its name from running under ground. It firſt diſappears at Box-hill, near Darking, in the county of Surry, and emerges again near Leatherhead.

MOLE, in zoology. See Talpa.

Moles in the fields may be deſtroyed by taking a head or two of garlic, onion or leek, and putting it into their holes; on which they will run out as if frighted, and you may kill them with a ſpear or dog. Or pounded hellebore, white or black, with wheat-flour, the white of an egg, milk, and ſweet-wine, or metheglin, may be made into a paſte, and pellets as big as a ſmall nut may be put into their holes: the moles will eat this with pleaſure, and will be killed by it. In places where you would not dig nor break much, the fuming their holes with brimſtone, garlic or other unſavoury things, drives them away; and if you put a dead mole into a common haunt, it will make them abſolutely forſake it.

Or take a mole-ſpear or ſtaff, and where you ſee them caſt, go lightly but not on the ſide betwixt them and the wind, leſt they perceive you; and at the firſt or ſecond putting up of the earth, ſtrike them with your mole-ſtaff downright, and mark which way the earth falls moſt: if ſhe caſts towards the left hand, ſtrike ſomewhat on the right hand; and ſo on the contrary, to the caſting up of the plain ground, ſtrike down, and there let it remain; then take out the tongue in the ſtaff, and with the ſpattle, or flat edge, dig round about your grain to the end thereof, to ſee if you have killed her; and if you have miſſed her, leave open the hole and ſtep aſide a little, and perhaps ſhe will come to ſtop the hole again, for they love but very little air; and then ſtrike her again; but if you miſs her, pour into the hole two gallons of water, and that will make her to come out for fear of drowning: mind them going out of a morning to feed or coming home when fed, and you may take a great many.

Mole, in midwifery, a maſs of fleſhy matter, of a ſpherical figure generated in the uterus, and ſometimes miſtaken for a child. See Midwifery.

Mole, or *Mark*. See Nævus.

Mole, in architecture, a maſſive work formed of large ſtones laid in the ſea by means of coffer dams, extended either in a right line or an arch of a circle, before a port, which it ſerves to cloſe; to defend the veſſels in it from the impetuoſity of the waves, and to prevent the paſſage of ſhips without leave. Thus we ſay the mole of the harbour of Meſſina, &c.

Mole is ſometimes alſo uſed to ſignify the harbour itſelf.

Mole, (*moles*,) among the Romans, was alſo uſed for a kind of mauſoleum, built in manner of a round tower on a ſquare baſe, inſulate, encompaſſed with columns, and covered with a dome.—The mole of the emperor Adrian, now the caſtle of St Angelo, was the greateſt and moſt ſtately of all the moles. It was crowned with a brazen pine apple, wherein was a golden urn containing the aſhes of the emperor.

Mole-cricket, in zoology. See Grillotalpa.

Mole-Hills, Theſe little hillocks of earth are a very great prejudice to the paſture lands, not only in waſting ſo much of the land as they cover, but in hindering the ſcythe in mowing. In the weſt of England they uſe a peculiar inſtrument for the breaking up of theſe; it is a flat board, very thick, and of about eight inches in diameter, into which there is faſtened a perpendicular handle of three or four feet long. It has four broad and ſharp iron teeth at the front, which readily cut through the hill, and ſpread the earth it conſiſts of; and behind there is a large knob proper for breaking the clods with, if there are any. Some uſe a ſpade, or other common inſtrument in the place of this, but not ſo well. There is however, a much better inſtrument even than this, for deſtroying theſe hills where they are in very great numbers. This is a kind of horſe-machine; it has a ſharp-iron about three feet over, and with a ſtrong back.—It is about four or five inches broad, and has two long handles for a horſe to be harneſſed to, and a croſs bar of iron to ſtrengthen it at the bottom of the handles, reaching from the one handle to the other. The middle of this croſs-bar is furniſhed with one, two, or more ſharp pieces of iron like ſmall plough ſhares, to cut the mole-hills into two, three or more parts. The iron behind is of a ſemicircular figure. A ſingle horſe is harneſſed to this machine, and a boy muſt be employed to drive it, and a man to hold and guide it; the ſharp irons or ſhares are the firſt things that meet the hill, they run through it, break its texture, and cut it into ſeveral parts; and the circular iron following immediately behind them, cuts up the whole by the roots, and leaves the land level. This inſtrument will deſtroy as many mole-hills in one day as a common labourer can in eight, and would be of very great advantage to the kingdom if brought into general uſe. It is to be obſerved, that this leaving a naked ſpace in the place of every hill, it will be neceſſary to go over the land. and ſow them with hay ſeed, otherwiſe theſe ſpots will want the produce of graſs the firſt years. The farmers in ſome parts of England are not willing to deſtroy the mole-hills, but let them ſtand from year to year, ſupppoſing that they get ſome ground by them; but the advantage by this means is ſo little, that it does not balance the unſightlineſs and damage to the mowing.

MOLESWORTH (Robert), Viſcount Moleſworth, an eminent ſtateſman and polite writer, born at Dublin in 1656, where his father was a merchant. He was attainted by King James for his activity on the prince of Orange's invaſion; but the latter, when he was ſettled on the throne, called up Mr Molſeworth into the privy-council, and ſent him envoy-extraordinary to the court of Denmark. Here he reſided above three years, and then returned upon ſome diſguſt, without an audience of leave. Upon his return, he drew up his Account of Denmark, a work well known, in which he repreſented that government as arbitrary; and hence gave great offence to George prince of Denmark. The Daniſh envoy preſented a Memorial to King William concerning it, and then furniſhed materials for an anſwer, which was executed by Dr William King. Mr Moleſworth was member of the houſes of commons in both kingdoms; King George I. made him a commiſſioner of trade and plantations, and advanced him to the peerage of Ireland, by the title of *Baron Philipſtown*, and *Viſcount Moleſworth of Swords*.

Swords. He died in 1725. Beſides his Account of Denmark, he wrote an addreſs to the houſe of commons, for the encouragement of agriculture; and tranſlated Franco Gallia, a Latin treatiſe of the civilian Hotteman, giving an account of the free ſtate of France, and other parts of Europe, before the encroachments made on their liberties.

MOLIERE (John Baptiſt), a famous French comedian, whoſe true name was *Pocquelin*, which for ſome reaſon or other he ſunk for that of Moliere. He was the ſon of a valet de chambre, and was born at Paris about the year 1620. He went through the ſtudy of the claſſics under the Jeſuits in the college of Clermont, and was deſigned for the bar; but at his quitting the law-ſchools, he made choice of the actor's profeſſion. From the prodigious fondneſs he had for the drama, his whole ſtudy and application being directed to the ſtage, he continued till his death to exhibit plays, which were greatly applauded. It is ſaid the firſt motive of his going upon the ſtage was to enjoy the company of an actreſs for whom he had contracted a violent fondneſs. His comedies are highly eſteemed. And it is no wonder he ſo juſtly repreſented domeſtic feuds, and the torments of jealous huſbands, or of thoſe who have reaſon to be ſo, it being aſſerted that no man ever experienced all this more than Moliere, who was very unhappy in his wife. His laſt comedy was *La Malade imaginaire*, which was brought on the ſtage in 1673; and Moliere died on the fourth night of its repreſentation; ſome ſay in acting the very part of the pretended dead man, which gave ſome excerciſe for the wits of the time; but according to others he died in his bed that night, from the burſting of a vein in his lungs by coughing. The king, as a laſt mark of his favour, prevailed with the archbiſhop of Paris to ſuffer him to be buried in conſecrated ground; though he had irritated the clergy by his *Tartuff.* The moſt eſteemed editions of his works are that of Amſterdam, 5 vols 12mo, 1692; and that of Paris, 6 vols 4to, 1734.

MOLINA (Lewis), a Spaniſh lawyer, who was employed by Philip II. king of Spain in the councils of the Indies and of Caſtile. He is the author of a learned treatiſe concerning the entails of the ancient eſtates of the Spaniſh nobility, entitled, *De Hiſpanorum Primogenitorum Origine et Natura*, publiſhed in 1603, in folio. This book is likewiſe applicable to ſeveral provinces in France. Lewis Molina muſt not be confounded with John Molina, a Spaniſh hiſtorian, author of *Cronica antiqua d' Arragon*, publiſhed in 1524, in folio; and alſo of *De las Caſas memoralles d'Eſpagna*, in folio. The firſt work appeared at Valencia, and the ſecond at Alcala.

MOLINÆUS. See Moulin.

MOLINISTS, in eccleſiaſtical hiſtory, a ſect in the Romiſh church, who follow the doctrine and ſentiments of the Jeſuit Molina, relating to ſufficient and efficacious grace. He taught that the operations of divine grace were entirely conſiſtent with the freedom of human will; and he introduced a new kind of hypotheſis to remove the difficulties attending the doctrines of predeſtination and liberty, and to reconcile the jarring opinions of Auguſtines, Thomiſts, Semi-Pelagians, and other contentious divines. He affirmed, that the decree of predeſtination to eternal glory was founded upon a previous knowledge and conſideration of the merits of the elect; that the grace, from whoſe operation theſe merits are derived, is not efficacious by its own intrinſic power only, but alſo by the conſent of our own will, and becauſe it is adminiſtered in thoſe circumſtances, in which the Deity, by that branch of his knowledge which is called *ſcientia media*, foreſees that it will be efficacious. The kind of preſcience, denominated in the ſchools *ſcientia media*, is that foreknowledge of future contingents that ariſes from an acquaintance with the nature and faculties of rational beings, of the circumſtances in which they ſhall be placed, of the objects that ſhall be preſented to them, and of the influence which their circumſtances and objects muſt have on their actions.

MOLINOS (Michael,) a Spaniſh prieſt, who endeavoured to ſpread new doctrines in Italy. He was born in the dioceſe of Saragoſſa in 1627; and entered into prieſt's orders, though he never held any eccleſiaſtical benefice. He was a man of good ſenſe and learning, and his life was exemplary; though inſtead of practiſing auſterities, he gave himſelf up to contemplation and myſtical devotion. He wrote a book intitled, *Il Guida Spirituale*, containing his peculiar notions, which was greedily read both in Italy and Spain. His followers are called *Quietiſts;* becauſe his chief principle was, that men ought to annihilate themſelves in order to be united to God, and afterwards remain in quietneſs of mind, without being troubled for what ſhall happen to the body. He was taken up in 1687; and his 68 propoſitions were examined by the pope and inquiſitors, who decreed that his doctrine was falſe and pernicious, and that his books ſhould be burned. He was forced to recant his errors publicly in the Dominicans church, and was condemned to perpetual impriſonment. He was 60 years old when he was taken, and had been ſpreading his doctrine 22 years before. He died in priſon in 1692.

MOLINOSISTS, a ſect among the Romaniſts, who adhere to the doctrine of Molinos. Theſe are the ſame with what are otherwiſe called *Quietiſts.*

MOLLOY (Charles, Eſq;), deſcended from a good family in the kingdom of Ireland, was born in the city of Dublin, and received part of his education at Trinity college there, of which he afterwards became a fellow. At his firſt coming to England he entered himſelf of the Middle Temple, and was ſuppoſed to have had a very conſiderable hand in the writing of a periodical paper called "Fogs's Journal;" as alſo ſince that time to have been almoſt the ſole author of another well-known paper, intitled "Common Senſe." All theſe papers give teſtimony of ſtrong abilities, great depth of underſtanding, and clearneſs of reaſoning. Dr King was a conſiderable writer in the latter, as were lords Cheſterfield and Lyttleton. Our author had large offers made him to write in defence of Sir Richard Walpole, but theſe he rejected; notwithſtanding which, at the great change in the miniſtry in 1742, he was entirely neglected, as well as his fellow labourer Amherſt, who conducted "The Craftſman." Mr Molloy, however, having married a lady of fortune, was in circumſtances which enabled him to treat the ingratitude of his patriotic friends with the contempt it deſerved. He lived many years after this period, dying ſo lately as July 16. 1767.

He alſo wrote three dramatic pieces, viz. The perplexed Couple; The Coquet; and, The Half-pay Officers; none of which met with much ſucceſs.

MOLLUGO, African chickweed: A genus of the trigynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 22d order, *Caryophyllei.* The calyx is pentaphyllous; there is no corolla; the capſule is trilocular, and trivalved. Its characters are theſe: The empalement of the flower is compoſed of five oblong ſmall leaves, coloured on their inſides, and permanent; the flower has five oval petals ſhorter than the empalement; and three briſtly ſtamina, which ſtand near the ſtyle, terminated by ſingle ſummits; it has an oval germen, having three furrows, ſupporting three very ſhort ſtyles: the germen becomes an oval capſule with three cells, filled with ſmall kidney-ſhaped ſeeds. There are ſeveral ſpecies, few of which are admitted into gardens. Miller reckons two and Linnæus five ſpecies. This plant is ſaid to have an aperitive virtue.

MOLUSCA, in the Linnæan ſyſtem, is the denomination of the ſecond genus of vermes or worms. Theſe are ſimple naked animals, not included in a ſhell, but furniſhed with limbs, and comprehend eighteen ſubordinate genera, and one hundred and ten ſpecies.

MOLO, a philoſopher of Rhodes, called alſo Apollonius. Some are of opinion that Apollonius and Molo are two different perſons, who were both natives of Alabanda, and diſciples of Menecles of the ſame place. They both viſited Rhodes, and there opened a ſchool; but Molo came ſome time after Apollonius. Molo had Cicero and J. Cæſar among his pupils.

MOLOCH, a falſe god of the Ammonites who dedicated their children to him, by making them "paſs through the fire," as the ſcriptures expreſs it. There are various opinions concerning this method of conſecration. Some think, the children leaped over a fire ſacred to Moloch; others that they paſſed between two fires; and others, that they were really burnt in the fire, by way of ſacrifice to this god. There is foundation for each of theſe opinions. For, firſt, it was uſeful among the pagans to luſtrate or purify with fire; and in the next place, it is expreſsly ſaid, that the inhabitants of Sepharvaim burnt their children in the fire to Anamelech and Adramelech; much ſuch deities as Moloch of the Ammonites.

Moſes, in ſeveral places, forbids the Iſraelites to dedicate their children to this god as the Ammonites did, and threatens death and utter extirpation to ſuch perſons as were guilty of this abominable idolatry. And there is great probability that the Hebrews were much addicted to the worſhip of this deity; ſince Amos, and after him St Stephen, reproaches them with having carried along with them into the wilderneſs the tabernacle of their god Moloch.

Solomon built a temple to Moloch upon the mount of Olives; and Manaſſeh, a long time after, imitated his impiety, by making his ſon paſs through the fire in honour of Moloch. It was chiefly in the valley of Tophet and Hinnom, to the eaſt of Jeruſalem, that the Iſraelites paid their idolatrous worſhip to this falſe god of the Ammonites.

There are various ſentiments concerning the relation which Moloch had to the other pagan divinities. Some believe he was the ſame with Saturn, to whom it is well known that human ſacrifices were offered. Others ſuppoſe him to be Mercury; others, Mars; others, Mithras; and others, Venus. Laſtly, others take Moloch to be the ſun, or the king of heaven. Moloch was likewiſe called *Milkom;* as appears from what is ſaid of Solomon, that he went after Aſhtaroth the abomination of the Zidonians, and Milkom the abomination of the Ammonites.

MOLOSSES, Molasses, or *Melaſſes,* that groſs fluid matter remaining of ſugar after refining, and which no boiling will bring to a conſiſtence more ſolid than that of ſyrup: hence alſo called *ſyrup of ſugar.*

Properly, molaſſes are only the ſediment of one kind of ſugar called *chypre,* or brown ſugar, which is the refuſe of other ſugars not to be whitened or reduced into loaves.

Moloſſes are much uſed in Holland for the preparation of tobacco, and alſo among poor people inſtead of ſugar. There is a kind of brandy or ſpirit made of moloſſes; but by ſome held exceedingly unwholeſome. See below.

Artificial Molosses. There has been found a method of making moloſſes from apples without the addition of ſugar. The apple that ſucceeds beſt in this operation is a ſummer ſweeting of a middle ſize, pleaſant to the taſte, and ſo full of juice that ſeven buſhels will yield a barrel of cyder.

The manner of making it is this: the apples are to be ground and preſſed, then the juice is to be boiled in a large copper, till three quarters of it be evaporated: this will be done with a moderate fire in about ſix hours, with the quantity of juice abovementioned; by this time it will be of the conſiſtence and taſte as well as of the colour of moloſſes.

This new moloſſes ſerves to all the purpoſes of the common kind, and it is of great uſe in preſerving cyder. Two quarts of it, put into a barrel of racked cyder, will preſerve it, and give it an agreeable colour.

The invention of this kind of moloſſes was owing to Mr Chandler of Woodſtock in New England, who living at a diſtance from the ſea, and where the common moloſſes was very dear and ſcarce, provided this for the ſupply of his own family, and ſoon made the practice among people of the neighbourhood. It is to be obſerved, that this ſort of apple, the ſweeting, is of great uſe in making cyder, one of the very beſt kinds we know being made of it. The people in New-England alſo feed their hogs with the fallings of the orchards of theſe apples; and the conſequences of this is, that their pork is the fineſt in the world.

Moloſſes Spirit; a very clean and pure ſpirit, much uſed in England, and made from moloſſes or common treacle diſſolved in water, and fermented in the ſame manner as malt or the common malt-ſpirit. See Distillation, n° 10.

Moloſſes ſpirit coming dearer than that of malt, it is frequently met with baſely adulterated with a mixture of that ſpirit, and indeed ſeldom is to be bought without ſome daſh of it. Many have a way of mixing malt in the fermenting liquor; by this the yield of the whole is greatly increaſed, and the maker may aſſure the buyer that the ſpirit is pure as it ran from the worm.

In moſt of the nice caſes in our compound diſtillery,

lery, the moloſſes-ſpirit ſupplies the place of a pure and clean ſpirit. Our cinnamon, citron, and other fine cordial waters, are made with it; for the malt ſpirit would impart to theſe a very diſagreeable flavour.

Moloſſes ſpirit gives a yellow ſtain to the hands or other ſubſtances dipped into it; and may therefore be of uſe in dyeing. It is poſſible alſo that the vinegar-makers may find uſe for it in their way; but the moſt advantageous of all its uſes is to the diſtiller himſelf; a quantity of it added to new treacle intended for fermentation will be of great uſe in the proceſs, and increaſe very conſiderably the quantity of ſpirit; but the proportion in regard to the new matter muſt not be too great.

MOLOSSI, a people of Epirus, who inhabited that part of the country which was called *Moloſſia* or *Moloſſus*, from king Moloſſes, a ſon of Pyrrhus and Andromache. This country had the bay of Ambracia on the ſouth, and the country of the Perrhæbeans on the eaſt. The dogs of the place were famous, and received the name of *Moloſſi* among the Romans. Dodona was the capital of the country, according to ſome writers. Others, however, reckon it as the chief city of Theſprotia.

MOLOSSUS, in the Greek and Latin poetry, a foot conſiſting of three long ſyllables. As *audiri*, *cantabant*, *virtutem*.

It takes its name either from a dance in uſe among the people called *Moloſſi* or *Epirotæ*; or from the temple of Jupiter Moloſſus, where odes were ſung, in which this foot had a great ſhare; or elſe becauſe the march of the Moloſſi, when they went to the combat, was compoſed of theſe feet, or had the cadence thereof. The ſame foot was alſo called among the ancients, *Vertumnus*, *extenſipes*, *hippius*, *&* *canius*.

MOLSA (Francis Maria), an eminent poet of the 16th century, was born at Modena. He gained ſo prodigious a reputation by his Latin and Italian poetry, that, as Paul Jovius tells us, "for 30 years together the patrons of wit at Rome ſtrove to promote him." If he had behaved with the leaſt prudence, he might eaſily have raiſed himſelf to conſiderable preferments and fortunes in the world; but he managed ſo ill that it was not poſſible to ſerve him.—He was entirely debauched, and at the ſame time devoid of all prudence and decency in the management of his pleaſures. Hence he deſtroyed his reputation, and put an abſolute ſtop to the progreſs of his fortunes. He died, in 1544, of the French diſeaſe. Molſa was a great orator as well as a great poet. He met once with a favourable opportunity of diſplaying his talent this way; for having ſeen the people of Rome highly incenſed againſt Lorenzo de Medicis, who had ſtruck off the heads of a great number of ancient ſtatues, he accuſed him of that action, and (according to Paul Jovius) made ſo lively an oration upon it, that he perfectly overwhelmed him with confuſion and deſpair: and it was generally believed that Lorenzo de Medicis was ſo confounded at the infamy with which he was branded in that oration, that, in order to efface it, he reſolved to reſtore the city of Florence to its liberty, by aſſaſſinating Alexander de Medicis his near relation, which he did in 1537.

MOLSA (Tarquinia), daughter of Camillo Molſa, knight of the order of St James of Spain, and granddaughter of Francis Maria Molſa, was one of the moſt accompliſhed ladies that ever appeared in the world; wit, learning, beauty, and virtue, all uniting, in her in a moſt extraordinary degree. Her father obſerving, while ſhe was yet very young, the goodneſs and excellence of her genius, procured her the beſt maſters in every branch of literature and ſcience. Lazaro Labadini, a celebrated grammarian of thoſe times, taught her polite literature; and her Latin compoſitions in proſe and verſe ſhow that ſhe attained the art of writing well, and compoſing correctly. She became learned in Ariſtotle under Camillo Corcapani; Anthony Guarini the mathematician taught her the doctrine of the ſphere; ſhe learned poetry under Francis Patricius the famous philoſopher; and logic and philoſophy under P. Latoni, who alſo inſtructed her thoroughly in the Greek tongue. The rabbi Abraham taught her the principles of the Hebrew language; and John Marier Barbier formed her in the politeneſs of the Tuſcan tongue; in which ſhe has not only written a great number of eaſy and elegant verſes, but likewiſe ſeveral letters and other pieces which are in high eſteem with the polite and learned in Italy. Beſides her original works, ſhe has tranſlated ſeveral things from Greek and Latin in a manner which ſhows her to have underſtood thoſe languages as well as her own. Afterwards ſhe learned muſic, as a relaxation and diverſion from her more ſerious ſtudies; and in this art ſhe attained the higheſt degree of perfection. She uſed to play upon the violin as well as upon the lute, and ſing to it at the ſame time in ſo exquiſite a taſte as charmed every hearer; and ſhe inſtituted at length a choir of ladies, over which ſhe herſelf uſed to preſide. This lady was in high reputation at the court of Alphonſus II. duke of Farrara, a prince of great judgment, and a paſſionate lover of every thing that was elegant; and we are told, that he ſtood raviſhed with admiration upon finding ſo many more accompliſhments than he had been taught to expect in her. But the moſt authentic teſtimony and declaration of her high merit and character, was that which ſhe received from the city of Rome; which, by a decree of the ſenate, in which all her excellencies and qualifications are ſet forth, honoured her with the title of *Singular*, and beſtowed the rights of a Roman citizen upon her and the whole family of Molſa. Molſa was married; but loſing her huſband without having any children, would never conſent to be married again, although ſhe was very young. She gave ſuch lively tokens of her grief, that Patricius compares her to another Artemiſia.

MOLUCILLA, in botany: A genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order, *Verticillatæ*. The calyx is campanulated, gradually widening larger than the corolla, and ſpinous.

MOLTEN-GREASE, in farriery. See there § xxii.

MOLUCCA ISLANDS, lie in the Eaſt Indian ſea under the line; of which there are five principal, namely, Ternate, Tydor, Machian, Motyr, and Bachian, The largeſt of them is hardly 30 miles in circumference. They produce neither corn, rice, nor cattle, except goats: but they have oranges, lemons, and other fruits; and are moſt remarkable for ſpices, eſpecially cloves. They have large ſnakes, which are not venomous, and very dangerous land crocodiles. At preſent they have three kings; and the Dutch, who are very ſtrong there, keep out all other European nations, being jealous of their ſpice-trade. The religion is idolatry; but there are many Mahometans. They were diſcovered by the Portugueſe in 1511, who ſettled upon the coaſt; but the Dutch drove them away, and are now maſters of all theſe iſlands.

MOLWITZ, a town of Sileſia, in the province of Grotſka, remarkable for a battle gained by the Pruſſians over the Auſtrians in 1741. E. Long, 16. 45. N. Lat. 50. 26.

MOLY. The name of this plant is rendered famous by Homer; and hence has been much inquired into, as to its true ſenſe, by the botaniſts of almoſt all times The old interpreters of Homer explain this word by the "wild rue;" and the only reaſon for this is, that at ſome time, probably long after the days of Homer, the people of Cappadocia called the wild rue *moly*. But this plant is wholly different from the moly of Homer, which Theophraſtus affirms grew in his time in Arcadia in great plenty, and had a round bulbous root like an onion, and long and graſſy leaves like the ſquill. On the whole, the moly of Homer ſeems to have been a ſpecies of allium or garlic.

MOLYBDENA, in chemiſtry, a mineral often confounded with plumbago or black lead, but poſſeſſed of different properties. It is compoſed of ſcaly laminæ of various magnitudes, ſcarcely adhering to each other; ſomewhat greaſy to the touch, ſoiling the fingers, and leaving traces on paper of a blackiſh grey colour. In powder it is of a bluiſh colour.

"Perfect molybdena (ſays Mr Fourcroy) ſlightly detonates with nitre; the reſidue contains molybdena, tartar, and calx of iron. From the experiments of Mr Scheele, molybdena appears to conſiſt of a peculiar combuſtible matter and iron. The nature of the combuſtible matter is not yet perfectly known. Mr Hielm, a diſciple of the celebrated Bergman, appears to have ſucceeded in converting it into a regulus. Mr Pelletier affirms, that he has had the ſame ſucceſs; but the properties of this new metal have not yet been examined. The molybdenic acid appears to be a metallic one. Its weight, its ſtyptic, and auſtere taſte, its dry and pulverulent form, its fuſibility, inſolubility, the colour it aſſumes by action of flame and combuſtible matters, its precipitation by nut-galls and the acid of Pruſſian blue, ſhow that it is ſomewhat ſimilar to the arſenical acid. This ſubſtance is ſo rare in France, that no chemiſt except M. Pelletier has had an opportunity of making a regular ſeries of experiments upon it. It is greatly to be wiſhed that they ſhould be continued, eſpecially with a view of deciding whether the Molybdenic acid be truly different from all others; for I cannot avoid thinking, notwithſtanding its peculiar characters, that a ſubſtance which does not become acid but by the aſſiſtance of 30 parts of weak nitrous acid, and is with ſo much difficulty brought to aſſume the ſaline ſtate, ought not to be conſidered as an acid truly peculiar." See CHEMISTRY-*Index*; and MINERALOGY, p. 134.

Molybdena is found ſometimes along with tin-ores and iron-ores, that are attracted by the magnet, among copperiſh pyrites; and alſo with wolfram, in Saxony, Iceland, Sweden, France, Spain, &c.

MOLYBDIA, in natural hiſtory, the name of a genus of cryſtals of a cubic form, or compoſed of ſix ſides, at right angles, like a dye.

MOLYN (Peter), called *Tempeſta* and *Pietro Mulier*, an eminent painter, was born at Haerlem in 1637. According to ſome authors, he was the diſciple of Snyders, whoſe manner of painting he at firſt imitated. But his genius led him to the ſtudy of diſmal ſubjects; and he ſo far excelled in painting tempeſts, ſtorms at ſea, and ſhipwrecks, that he was called by way of diſtinction *Tempeſta*. His pictures are very rare, and held in the greateſt eſtimation. The name of *Pietro Mulier*, or *du Mulieribus*, was given him on account of having cauſed his wife to be aſſaſſinated, in order to marry a young lady of Genoa with whom he was in love. But this villanous tranſaction being diſcovered, he was ſeized, impriſoned, and capitally condemned. However, the greatneſs of his merit as an artiſt occaſioned a mitigation of the ſentence; but he was ſtill detained in priſon, where he diligently followed his profeſſion, and would have continued there in all probability for life, had he not met with an opportunity of eſcaping to Placentia, at the time Louis XIV. bombarded the city of Genoa, after he had been in confinement 16 years. To this artiſt are attributed ſeveral very neat prints, executed with the graver only, in a ſtyle greatly reſembling that of John Vander Velde. They conſiſt chiefly of candle-light pieces and dark ſubjects. M. Heinekin mentions *Peter Molyn* the elder, who was a native of Holland, and a painter; but not ſo eminent as Tempeſta. Some ſuppoſe the prints abovementioned ought to be aſcribed to the latter; as, though very neatly executed, they are laboured heavy performances, and not equal in any degree to what one might expect from the hand of an artiſt of ſo much repute as Tempeſta.

MOLYNEUX (William), an excellent mathematician and aſtronomer, was born at Dublin in 1656, and admitted into the univerſity of that city; which when he left, he carried with him a teſtimonial drawn up in an uncommon form, and in the ſtrongeſt terms, ſignifying the high opinion conceived of his genius, the probity of his manners, and the remarkable progreſs he had made in letters. In 1675, he entered in the middle-temple, where he ſpent three years in the ſtudy of the laws of his country; but the bent of his genius lay ſtrongly toward mathematics and philoſophical ſtudies; and even at the univerſity he conceived a diſlike to ſcholaſtic learning, and fell into the methods of Lord Bacon. Returning to Ireland in June 1678, he ſhortly after married Lucy the daughter of Sir William Domvile the king's attorney-general. Being maſter of an eaſy fortune, he continued to indulge himſelf in proſecuting ſuch branches of natural and experimental philoſophy as were moſt agreeable to his fancy; wherein aſtronomy having the greateſt ſhare, he began, about 1681, a literary correſpondence with Flamſtead the king's aſtronomer, which he kept up for ſeveral years. In 1683, he formed a deſign of erecting a philoſophical ſociety at Dublin, in imitation

tion of the Royal Society at London; and, by the countenance and encouragement of Sir William Petty, who accepted the office of preſident, they began a weekly meeting that year, when our author was appointed their firſt ſecretary.

Mr Molyneux's reputation for learning recommended him, in 1684, to the notice and favour of the firſt and great duke of Ormond, then lord-lieutenant of Ireland; and chiefly by his grace's influence he was appointed, that year, with Sir William Robinſon, ſurveyor general of his majeſty's buildings and works, and chief engineer. In 1686 he was ſent abroad by the government to view the moſt conſiderable fortreſſes in Flanders. He travelled, in company with Lord Mountjoy, through that country, Holland, part of Germany, and France. Upon his return from Paris to London, in April 1680, he publiſhed his *Sciothericum Teleſcopium*, containing a deſcription of the ſtructure and uſe of a teleſcopial dial invented by him. The ſeverities of Tyrconnel's government forced him, with many others, into England, where he ſpent two years with his family, his place of reſidence being at Cheſter. In this retirement he wrote his Dioptrics, dedicated to the Royal Society. Here he loſt his lady, who died ſoon after ſhe had brought him a ſon. Illneſs had deprived her of her eye-ſight 12 years before, that is, ſoon after ſhe was married; from which time ſhe had been very ſickly, and afflicted with extreme pains of the head. As ſoon as the public tranquillity was ſettled in his native country, he returned home; and, upon the convening of a new parliament in 1692, was choſen one of the repreſentatives for the city of Dublin. In the next parliament, in 1695, he was choſen to repreſent the univerſity there, and continued to do ſo to the end of his life; that learned body having, before the end of the firſt ſeſſion of the former conferred on him the degree of doctor of laws. He was likewiſe nominated by the lord-lieutenant one of the commiſſioners for the forfeited eſtates, to which employment was annexed a ſalary of 500l. a-year; but looking upon it as an invidious office, he declined it. In 1698, he publiſhed "The Caſe of Ireland ſtated, in relation to its being bound by Acts of Parliament made in England:" in which he is ſuppoſed to have delivered all, or moſt that can be ſaid upon this ſubject, with great clearneſs and ſtrength of reaſoning. Among many perſons with whom he maintained correſpondence and friendſhip, Mr Locke was in a particular degree dear to him, as appears from their letters. In the above year, which was the laſt of his life, he made a journey to England, on purpoſe to pay a viſit to that great man; and not long after his return to Ireland was ſeized with a fit of the ſtone, of which he died. Beſides the works already mentioned, he publiſhed ſeveral pieces in the Philoſophical Tranſactions.

Molyneux (Samuel) ſon of the former, was born at Cheſter in July 1689; and educated with great care by his father, according to the plan laid down by Locke upon that ſubject. When his father died, he fell under the management of his uncle, Dr Thomas Molyneux, an excellent ſcholar and phyſician at Dublin, and alſo an intimate friend of Mr Locke; who executed his truſt ſo well, that Mr Molyneux became afterwards a moſt polite and accompliſhed gentleman, and was made ſecretary to his late majeſty when he was prince of Wales. Aſtronomy being his favourite ſtudy, as it had been his father's, he projected many ſchemes for the advancement of it, and was particularly employed in in the years 1723, 1724, and 1725, in perfecting the method of making teleſcopes; one of which, of his own making, he had preſented to John V. king of Portugal. In the midſt of theſe thoughts being appointed a commiſſioner of the admiralty, he became ſo engaged in public affairs, that he had not leiſure to purſue theſe enquiries any further; and gave his papers to Dr Robert Smith, profeſſor of aſtronomy at Cambridge, whom he invited to make uſe of his houſe and apparatus of inſtruments, in order to finiſh what he had left imperfect, Mr Molyneux dying ſoon after, Dr Smith loſt the opportunity, yet, ſupplying what was wanting from Mr Huygens and others, he publiſhed the whole in his "Complete Treatiſe of Optics."

MOMBAZA, or Monbaza, a town of Africa, in an iſland of the ſame name, with a caſtle and fort: ſeated on the eaſtern coaſt, oppoſite to the country of Mombaza in Zanguebar, 70 miles ſouth of Melinda, and ſubject to Portugal. E. Long. 48. 0. N. Lat. 44. 0.

Mombaza, a country of Africa in Zanguebar, ſubject to the Portugueſe, from whence they export ſlaves, gold, ivory, rice, fleſh, and other proviſions, with which they ſupply the ſettlements in Braſil. The king of this country being a Chriſtian, had a quarrel with the Portugueſe governor, took the caſtle by aſſault, turned Mahometan, and murdered all the Chriſtians, in 1631: but in 1729 they became maſters of the territory again,

MOMENT, in the doctrine of time, an inſtant, or the moſt minute and indiviſible part of duration

MOMENTUM, in mechanics, ſignifies the ſame with impetus, or the quantity of motion in a moving body; which is always equal to the quantity of matter multiplied into the velocity; or, which is the ſame thing, it may be conſidered as a rectangle under the quantity of matter and velocity. See Mechanics.

MOMORDICA, male balsam apple: A genus of the ſyngeneſia order, belonging to the monoecia claſs of plants; and in the natural method ranking under the 34th order, *Cucurbitaceæ*. The male calyx is quinquefid; the corolla ſexpartite; the filaments are three in number. The female calyx is trifid; the corolla quinquepartite; the ſtyle trifid; the fruit is an apple parting aſunder with a ſpring. The moſt remarkable ſpecies are, 1. The balſamina, or male balſam apple. This is a native of Aſia; and has a trailing ſtalk like thoſe of the cucumber or melon, with ſmooth leaves, cut into ſeveral ſegments, and ſpread open like a hand. The fruit is oval, ending in acute points, having ſeveral deep angles, with ſharp tubercles placed on their edges. It changes to a red or purpliſh colour when ripe, opening with an elaſticity, and throwing out its ſeeds. 2. The elaterium, wild or ſpurting cucumber, has a large fleſhy root, ſomewhat like briony, from whence come forth every ſpring ſeveral thick, rough, trailing ſtalks, dividing into many branches, and extending every way two or three feet; theſe are garniſhed with thick, rough, almoſt heart-ſhaped leaves, of a grey colour, ſtanding upon long foot ſtalks. The flowers come out from the wings of the ſtalks: theſe are male and female, growing at different places on the ſame plant like thoſe of the common cucumber: but they are much leſs, of a pale yellow colour, with a greeniſh bottom; the male flowers ſtand upon thick, ſhort, foot-ſtalks, but the female flowers ſit upon the young fruit; which, after the flower is faded, grows of an oval form, an inch and a half long, ſwelling like a cucumber, of a grey colour like the leaves, and covered over with ſhort prickles. This ſpecies has one of its names from the property of caſting out its ſeeds, together with the viſcid juice in which the ſeeds are lodged, with a violent force, if touched when ripe.

Uſes. The firſt ſpecies is famous in Syria for curing wounds. The natives cut open the unripe fruit, and infuſe it in ſweet oil, which they expoſe to the ſun for ſome days, until it becomes red; and then preſerve it for uſe. Dropped on cotton, and applied to a freſh wound, the Syrians reckon this oil the beſt vulnerary next to balſam of Mecca, having found by experience that it often cures large wounds in three days. The leaves and ſtems of this plant are uſed for arbours or bowers. The elaterium of the ſhops is the fruit, or rather the inſpiſſated fæcula, of the juice of the unripe fruit of the wild cucumber. It is uſually brought to Britain from Spain and the ſouthern parts of France, where the plant is common. It is brought to Britain in ſmall, flat, whitiſh lumps, or cakes, that are dry, and break eaſily between the fingers. It is of an acrid, nauſeous, bitter taſte, and has a ſtrong offenſive ſmell when newly made; but theſe, as well as its other properties, it loſes after being kept for ſome time. It is a very violent purge and vomit, and is now but ſeldom uſed. From the property which the plant has of throwing out its ſeeds, it has ſometimes been called *Noli me tangere*.

MOMUS, in fabulous hiſtory, the god of raillery, or the jeſter of the celeſtial aſſembly, and who ridiculed both gods and men. Being choſen by Vulcan, Neptune, and Minerva, to give his judgment concerning their works, he blamed them all: Neptune for not making his bull with horns before his eyes, in order that he might give a ſurer blow; Minerva for building a houſe that could not be removed in caſe of bad neighbours; and Vulcan, for making a man without a window in his breaſt, that his treacheries might be ſeen. For his free reflections upon the gods, Momus was driven from heaven. He is generally repreſented raiſing a maſk from his face, and holding a ſmall figure in his hand.

MONA, two iſlands of this name in the ſea lying between Britain and Ireland. The one deſcribed by Cæſar, as ſituated in the mid-paſſage between both iſlands, and ſtretching out in length from ſouth to north. Called *Monaœda* (Ptolemy); *Monopia*, or *Monabia* (Pliny). Suppoſed to be the Iſle of Man.—Another Mona, (Tacitus); an iſland more to the ſouth, and of greater breadth; ſituated on the coaſt of the Ordovices, from which it is ſeparated by a narrow ſtrait. The ancient ſeat of the Druids. Now called *Angleſey*, the iſland of the Angles or Engliſh.

Mona, an iſland of the Baltic Sea, ſouth-weſt of the iſland of Zealand, ſubject to Denmark. E. Long. 12. 30. N. Lat. 55. 20.

Mona. See Inchcolm.

MONACO, a ſmall but handſome and ſtrong town of Italy, in the territory of Genoa, with a caſtle, citadel, and a good harbour. It is ſeated on a craggy rock, and has its own prince, under the protection of France. E. Long. 7. 33. N. Lat. 43. 48.

MONAD, ſee *Leibnitzian Philoſophy*.

MONADELPHIA, (from μονος *alone*, and αδελφια a *brotherhood*,) a "ſingle brotherhood:" The name of the 16th claſs in Linnæus's ſexual ſyſtem, conſiſting of plants with hermaphrodite flowers; in which all the ſtamina or male organs of generation are united below into one body or cylinder, through which paſſes the pointal or female organ. See Botany, p. 437.

MONAGHAN, a county of Ireland, ſituated in the province of Ulſter, is bounded by Tyrone on the north, Armagh on the eaſt, Cavan and Louth on the ſouth, and Fermanagh on the weſt. It is a boggy and mountainous tract, but in ſome places is well improved. It contains 170,090 Iriſh plantation acres, 24 pariſhes, five baronies, and one borough, and ſends four members to parliament. It is about 30 miles long and 22 broad. The linen trade of this county is averaged at L. 104,000 yearly.

Monaghan, a poſt, fair, and market town, and chief of the county of that name, is diſtant 62 miles from Dublin; it is a borough, and returns two members to parliament; patron Lord Clermont. It gives title of baron to the family of Blayney, and has ſix fairs. It was anciently called *Muinechan*. An abbey was founded here in a very early age, of which Moelodius, the ſon of Aodh was abbot. In 1462, a monaſtery for conventual Franciſcans was erected on the ſite of this abbey, which was granted on the general ſuppreſſion of monaſteries to Edward Withe, and a caſtle has been ſince erected on the ſite by Edward Lord Blayney.

MONAMY (P.), a good painter of ſea-pieces, was born in Jerſey; and certainly (ſays Mr Walpole), from his circumſtances or the views of his family he had little reaſon to expect the fame he afterwards acquired, having received his firſt rudiments of drawing from a ſign and houſe painter on London bridge. But when nature gives real talents they break forth in the homelieſt ſchool. The ſhallow waves that rolled under his window taught young Monamy what his maſter could not teach him, and fitted him to imitate the turbulence of the ocean. In painter's hall is a large piece by him, painted in 1726. He died at his houſe in Weſtminſter the beginning of 1749.

MONANDRIA, (from μονος *alone*, and ανηρ a *man* or *huſband*:) the name of the firſt claſs in Linnæus's ſexual ſyſtem; conſiſting of plants with hermaphrodite flowers, which have only one ſtamen or male organ.

MONARCHY, a large ſtate governed by one; or a ſtate where the ſupreme power is lodged in the hands of a ſingle perſon. The word comes from the Greek μοναρχης, "one who governs alone; formed of μονος, *ſolus*, and αρχη *imperium*, "government." Of the three forms of government, viz. democracy, ariſtocracy, and monarchy, the laſt is the moſt powerful, all the ſinews of government being knit together, and united in the hand of the prince; but then there is imminent danger of his employing that ſtrength to improvident or oppreſſive purpoſes. As a democracy is the beſt calculated to direct the end of a law, and an ariſtocracy to invent the means by which that end ſhall be obtained, a monarchy is moſt fit for carrying thoſe means into execution.

The moſt ancient monarchy was that of the Aſſyrians, which was founded ſoon after the deluge. We uſually reckon four grand or univerſal monarchies; the Aſſyrian, Perſian, Grecian, and Roman; though St Auguſtine makes them but two, viz. thoſe of Babylon and Rome. Belus is placed at the head of the ſeries of Aſſyrian kings who reigned at Babylon, and is by profane authors eſteemed the founder of it, and by ſome the ſame whom the ſcriptures call Nimrod. The principal Aſſyrian kings after Belus were Ninus, who built Nineveh, and removed the ſeat of empire to it; Semiramis, who, diſguiſing her ſex, took poſſeſſion of the kingdom inſtead of her ſon, and was killed and ſucceeded by her ſon Ninyas; and Sardanapalus, the laſt of the Aſſyrian monarchs, and more effeminate than a woman. After his death the Aſſyrian empire was ſplit into three ſeparate kingdoms, viz. the Median, Aſſyrian, and Babylonian. The firſt king of the Median kingdom was Arbaces; and this kingdom laſted till the time of Aſtyages, who was ſubdued and diveſted of his kingdom by Cyrus.

In the time of Cyrus there aroſe a new and ſecond monarchy called the Perſian, which ſtood upwards of 200 years from Cyrus, whoſe reign began A. M. 3468, to Darius Codomannus, who was conquered by Alexander, and the empire tranſlated to the Greeks, A. M. 3674.—The firſt monarch was Cyrus, founder of the empire. 2. Cambyſes, the ſon of Cyrus. 3. Smerdis. 4. Darius, the ſon of Hyſtaſpis, who reigned 521 years before Chriſt. 5. Xerxes, who reigned 485 years before Chriſt. 6. Artaxerxes Longimanus, who reigned 464 years before Chriſt. 7. Xerxes the ſecond. 8. Ochus, or Darius, called Nothus, 424 years before Chriſt. 9. Artaxerxes Mnemon, 405 years before Chriſt. 10. Artaxerxes Ochus, 359 years before Chriſt. 11. Arſes, 338 years before Chriſt. 12. Darius Codomannus, 336 years before Chriſt, who was defeated by Alexander the Great, and deprived of his kingdom and life about 331 years before Chriſt: the dominion of Perſia after his death was tranſlated to the Greeks.

The third monarchy was the Grecian. As Alexander, when he died, did not declare who ſhould ſucceed him, there ſtarted up as many kings as there were commanders. At firſt they governed the provinces that were divided among them under the title of viceroys; but when the family of Alexander the Great was extinct, they took upon them the name of kings. Hence, in proceſs of time, the whole empire of Alexander produced four diſtinct kingdoms, viz. 1. The Macedonian; the kings of which, after Alexander, were Antipater, Caſſander, Demetrius Poliorcetes, Seleucus Nicanor, Meleager, Antigonus Doſon, Philip, and Perſeus, under whom the Macedonian kingdom was reduced to the form of a Roman province. 2. The Aſiatic kingdom, which upon the death of Alexander fell to Antigonus, comprehending that country now called Natolia, together with ſome other regions beyond Mount Taurus. From this kingdom proceeded two leſſer ones, viz. that of Pergamus, whoſe laſt king, Attalus, apointed the Roman people to be his heir; and Pontus, reduced by the Romans into the form of a province, when they had ſubdued the laſt king, Mithridates. 3. The Syrian of whoſe twenty-two kings the moſt celebrated were, Seleucus Nicanor, founder of the kingdom; Antiochus Deus; Antiochus the Great; Antiochus Epiphanes; and Tigranes, who was conquered by the Romans under Pompey; and Syria reduced into the form of a Roman province. 4. The Egyptian which formed by the Greeks in Egypt, and flouriſhed near 240 years under 12 kings, the principal of whom were, Ptolemy Lagus, its founder; Ptolemy Philadelphus, founder of the Alexandrian library; and queen Cleopatra, who was overcome by Auguſtus, in conſequence of which Egypt was added to the dominion of the Romans.

The fourth monarchy was the Roman, which laſted 244 years, from the building of the city until the time when the royal power was abrogated. The kings of Rome were. Romulus, its founder; Numa Pompilius; Tullus Hoſtilius; Ancus Martius; Tarquinius Priſcus; Servius Tullius; and Tarquin the Proud, who was baniſhed, and with whom terminated the regal power.

There ſeems in reality no neceſſity to make the Medes, Perſians, and Greeks, ſucceed to the whole power of the Aſſyrians, to multiply the number of the monarchies. It was the ſame empire ſtill; and the ſeveral changes that happened in it did not conſtitute different monarchies. Thus the Babylonian empire was ſucceſſively governed by princes of different nations, yet without any new monarchy being formed thereby. Rome, therefore, may be ſaid to have immediately ſucceeded Babylon in the empire of the world. See Empire.

Of monarchies ſome are abſolute and deſpotic, where the will of the monarch is uncontroulable; others are limited, where the prince's authority is reſtrained by laws, and part of the ſupreme power lodged in other hands, as in Britain. See Government.

Some monarchies again are hereditary, where the ſucceſſion devolves immediately from father to ſon; and others are elective, where, on the death of the monarch, his ſucceſſor is appointed by election, as in Poland.

Fifth-Monarchy Men, in the eccleſiaſtical hiſtory of England, were a ſet of wrong-headed and turbulent enthuſiaſts who aroſe in the time of Cromwell, and who expected Chriſt's ſudden appearance upon earth to eſtabliſh a new kingdom; and, acting in conſequence of this alluſion, aimed at the ſubverſion of all human government.

MONARDA, Indian horehound, in botany: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking under the 42d order, *Verticillatæ*. The corolla is unequal, with the upper lip lineal, involving the filaments; there are four ſeeds. The moſt remarkable ſpecies is the zeylanica, a native of the Eaſt Indies. It riſes with an herbaceous, four-cornered, hoary ſtalk, and bears leaves that are entire, nearly heart-ſhaped, woolly, deep notched on the edges, and having footſtalks. The flowers, which are purpliſh and fragrant, ſurround the ſtalk in whorls, each whorl containing about 14 flowers: and are ſucceeded by four ſmall kidney-ſhaped ſhining ſeeds, lodged in the bottom of the permanent flower-cup. The Indians ſuperſtitiouſly believe that a fumigation of this plant is effectual for driving away the devil; and from this imaginary property its name in the Ceylonefe language is derived. Grimmius relates, in his *Laloratorium Ceylonicum*, that for taſte and ſmell this ſpecies of horehound ſtands remarkably diſtinguiſhed. A water and ſubtile oil are obtained from it, both of which are greatly commended in obſtructions of the matrix. A ſyrup is likewiſe prepared from this plant, which is uſeful in the abovementioned diſorders as well as in diſeaſes of the ſtomach.

MONARDES (Nicholas), an excellent Spaniſh phyſician of Seville, who lived in the 16th century: and deſervedly acquired great reputation by his practical ſkill and the books which he wrote. His Spaniſh works have been tranſlated into Latin by Cluſius, into Italian by Annibal Brigantus, and thoſe upon American drugs have appeared in Engliſh. He died about the year 1578.

MONASTEREVAN, a poſt town of Ireland, in the country of Kildare and province of Leinſter, 36 miles from Dublin. This town takes its name from a magnificent abbey which was founded here, in which St Evan in the beginning of the 7th century placed a number of monks from ſouth Munſter, and which had the privilege of being a ſanctuary, St Evan's feſtival is held on the 22d of December. The conſecrated bell, which belonged to this ſaint, was on ſolemn trials ſworn upon by the whole tribe of the Eoganachts, and was always committed to the care of the Mac Evans, hereditary chief juſtices of Munſter; the abbot of this houſe ſat as a baron in parliament.—At the general ſuppreſſion of monaſteries, this abbey was granted to George Lord Audley, who aſſigned it to Adam Loftus, viſcount Ely. It afterwards came into the family of Moor, earls of Drogheda, and has been beautifully repaired by the preſent Lord Drogheda, ſtill wearing the venerable appearance of an abbey. There is a nurſery at Monaſterevan for the charter ſchools of the province of Leinſter; and the grand canal has been carried up to this town from Dublin, ſince which it has been much improved and enlarged with ſeveral new buildings. It is a market-town, and alſo holds four fairs in the year.

MONASTERY, a convent or houſe built for the reception of religious; whether it be abbey, priory, nunnery, or the like.

MONASTERY is only properly applied to the houſes of monks, mendicant friars, and nuns. The reſt are more properly called *religious houſes*. For the origin of monaſteries, ſee MONASTIC and MONK.

The houſes belonging to the ſeveral religious orders which obtained in England and Wales were, cathedrals, colleges, abbeys, priories, preceptories, commandries, hoſpitals, friaries, hermitages, chantries, and free chapels. Theſe were under the direction and management of various officers. The diſſolution of houſes of this kind began ſo early as 1312, when the Templars were ſuppreſſed; and in 1323 their lands, churches, advowſons, and liberties, in England, were given by 17 Ed. II. ſt. 3. to the prior and brethren of the hoſpital of St John at Jeruſalem. In the years 1390, 1437, 1441, 1459, 1497, 1505, 1508, and 1515, ſeveral other houſes were diſſolved, and their revenues ſettled on different colleges in Oxford and Cambridge. Soon after the laſt period, Cardinal Wolſey, by licence of the king and pope, obtained a diſſolution of above 30 religious houſes for the founding and endowing his colleges at Oxford and Ipſwich. About the ſame time a bull was granted by the ſame pope to Cardinal Wolſey to ſuppreſs monaſteries, where there were not above ſix monks, to the value of 8000 ducats a-year, for endowing Windſor and King's College in Cambridge; and two other bulls were granted to Cardinals Wolſey and Campeius, where there were leſs than twelve monks, and to annex them to the greater monaſteries; and another bull to the ſame cardinals to inquire about abbeys to be ſuppreſſed in order to be made cathedrals. Although nothing appears to have been done in conſequence of theſe bulls, the motive which induced Wolſey and many others to ſuppreſs theſe houſes was the deſire of promoting learning; and Archbiſhop Cranmer engaged in it with a view of carrying on the Reformation. There were other cauſes that concurred to bring on their ruin: many of the religious were looſe and vicious; the monks were generally thought to be in their hearts attached to the pope's ſupremacy; their revenues were not employed according to the intent of the donors; many cheats in images, feigned miracles, and counterfeit relics, had been diſcovered, which brought the monks into diſgrace; the Obſervant friars had oppoſed the king's divorce from Queen Catherine; and theſe circumſtances operated, in concurrence with the king's want of a ſupply and the people's deſire to ſave their money, to forward a motion in parliament, that in order to ſupport the king's ſtate and ſupply his wants, all the religious houſes might be conferred upon the crown which were not able to ſpend above L. 200 a-year; and an act was paſſed for that purpoſe 27 Hen. VIII. c. 28. By this act about 380 houſes were diſſolved, and a revenue of L. 30,000 or L. 32,000 a-year came to the crown; beſides about L. 100,000 in plate and jewels. The ſuppreſſion of theſe houſes occaſioned diſcontent, and at length an open rebellion: when this was appeaſed, the king reſolved to ſuppreſs the reſt of the monaſteries, and appointed a new viſitation; which cauſed the greater abbeys to be ſurrendered apace; and it was enacted by 31 Hen. VIII. c. 13. that all monaſteries, &c. which have been ſurrendered ſince the 4th of February, in the 27th year of his majeſty's reign, and which hereafter ſhall be rendered, ſhall be veſted in the king. The knights of St John of Jeruſalem were alſo ſuppreſſed by the 32 Hen. VIII. c. 24. The ſuppreſſion of theſe greater houſes by theſe two acts produced a revenue to the king of above L. 100,000 a-year beſides a large ſum in plate and jewels. The laſt act of diſſolution in this king's reign was the act of 37 Hen. VIII. c. 4. for diſſolving colleges, free chapels, chantries, &c. which act was farther enforced by 1 Edward. VI. c. 14. By this act were ſuppreſſed 90 colleges, 110 hoſpitals, and 2374 chantries and free chapels. The number of houſes and places ſuppreſſed from firſt to laſt, ſo far as any calculations appear to have been made, ſeems to be as follow:

Monaſtery.

Of leſſer monaſteries, of which we have the valuation, - - -	374
Of greater monaſteries, - -	186
Belonging to the hoſpitallers, -	48
Colleges, - - -	90
Hoſpitals, - - -	110
Chantries and free chapels, -	2374
Total	3182

Beſides the friars houſes and thoſe ſuppreſſed by Wolſey, and many ſmall houſes of which we have no particular account.

The ſum total of the clear yearly revenue of the ſeveral houſes at the time of their diſſolution, of which we have any account, ſeems to be as follows:

Of the greater monaſteries,	L.104,919	13	3½
Of all thoſe of the leſſer monaſteries of which we have the valuation,	29,702	1	10½
Knights hoſpitallers head houſe in London, - -	2385	12	8
We have the valuation of only 28 of their houſes in the country,	3026	9	5
Friars houſes of which we have the valuation, - -	751	2	0¼
Total	L.140,784	19	3¼

If proper allowances are made for the leſſer monaſteries and houſes not included in this eſtimate, and for the plate, &c. which came into the hands of the king by the diſſolution, and for the value of money at that time, which was at leaſt ſix times as much as at preſent, and alſo conſider that the eſtimate of the lands was generally ſuppoſed to be much under the real worth, we muſt conclude their whole revenues to have been immenſe.

It does not appear that any computation hath been made of the number of perſons contained in the religious houſes.

Thoſe of the leſſer monaſteries diſſolved by 27 Hen. VIII. were reckoned at about	10,000
If we ſuppoſe the colleges and hoſpitals to have contained a proportionable number, theſe will make about - -	5347
If we reckon the number in the greater monaſteries, according to the proportion of their revenues, they will be about 35,000; but as probably they had larger allowances in proportion to their number than thoſe of the leſſer monaſteries, if we abate upon that account 5000, they will then be	30,000
One for each chantry and free chapel,	2374
Total	47,721

But as there were probably more than one perſon to officiate in ſeveral of the free chapels, and there were other houſes which are not included within this calculation, perhaps they may be computed in one general eſtimate at about 50,000. As there were penſions paid to almoſt all thoſe of the greater monaſteries, the king did not immediately come into the full enjoyment of their whole revenues: however, by means of what he did receive, he founded ſix new biſhoprics, viz. thoſe of Weſtminſter (which was changed by Queen Eliſabeth into a deanery, with twelve prebends and a ſchool), Peterborough, Cheſter, Glouceſter, Briſtol, and Oxford. And in eight other ſees he founded deaneries and chapters, by converting the priors and monks into deans and prebendaries, viz. Canterbury, Wincheſter, Durham, Worceſter, Rocheſter, Norwich, Ely, and Carliſle. He founded alſo the colleges of Chriſt-church in Oxford and Trinity in Cambridge, and finiſhed King's college there. He likewiſe founded profeſſorſhips of divinity, law, phyſic, and of the Hebrew and Greek tongues, in both the ſaid univerſities. He gave the houſe of Grey-friars and St Bartholomew's hoſpital to the city of London, and a perpetual penſion to the poor knights of Windſor, and laid out great ſums in building and fortifying many ports in the channel. It is obſervable, upon the whole, that the diſſolution of theſe houſes was an act, not of the church, but of the ſtate; in the period preceding the Reformation, by a king and parliament of the Roman catholic communion in all points except the king's ſupremacy; to which the pope himſelf, by his bulls and licences, had led the way.

Monaſtic ‖ Moncrif.

MONASTIC, ſomething belonging to monks, or the monkiſh life. The monaſtic profeſſion is a kind of civil death, which in all worldly matters has the ſame effect with the natural death. The council of Trent, &c. fix ſixteen years for the age at which a perſon may be admitted into the monaſtical ſtate.

St Anthony is the perſon who, in the fourth century, firſt inſtituted the monaſtic life; as St Pachomius, in the ſame century, is ſaid to have firſt ſet on foot the cœnobitic life, *i. e.* regular communities of religious. In a ſhort time the deſarts of Egypt became inhabited with a ſet of ſolitaries, who took upon them the monaſtic profeſſion. St Baſil carried the monkiſh humour into the eaſt, where he compoſed a rule which afterwards obtained through a great part of the weſt.

In the 11th century the monaſtic diſcipline was grown very remiſs. St Odo firſt began to retrieve it in the monaſtery of Cluny: that monaſtery, by the conditions of its erection, was put under the immediate protection of the holy ſee; with a prohibition to all powers, both ſecular and eccleſiaſtical, to diſturb the monks in the poſſeſſion of their effects or the election of their abbot. In virtue hereof they pleaded an exemption from the juriſdiction of the biſhop, and extended this privilege to all the houſes dependent on Cluny. This made the firſt congregation of ſeveral houſes under one chief immediately ſubject to the pope, ſo as to conſtitute one body, or, as they now call it, one *religious order*. Till then, each monaſtery was independent and ſubject to the biſhop. See **Monk**.

MONCAON, or **Monzon**, a town of Portugal, in the province of Entre-Douro-de-Minho, with a ſtrong caſtle. The Spaniards have ſeveral times attempted to take it, but in vain. W. Long. 8. 2. N. Lat. 41. 52.

MONCON, or **Monzon**, a ſtrong town of Spain, in the kingdom of Arragon. It was taken by the French in 1642, but the Spaniards retook it the following year. It is ſeated at the confluence of the rivers Soſa and Cinca. E. Long. 0. 19. N. Lat. 41. 43.

MONCRIF (François Auguſtin Paradis de), ſecretary to M. le comte de Clermont, reader to the queen, one of the 40 of the French academy, and a member of the academies of Nancy and Berlin, was born at Paris of reſpectable parents, A. D. 1687, and died there, Nov. 12. 1770, aged 83.

> *Avec des mœurs dignes de l'age d'or,*
> *Il fut un ami ſur, un auteur agréable ;*
> *Il mourut vieux comme* Neſtor,
> *Mais il fut moins bavard et beaucorp plus amaible..*

Such was Moncrif. He poſſeſſed an elegant mind, an engaging perſon, an unceaſing deſire to pleaſe, and a gentle, equable, and obliging temper. The advantage of reading in a very ſuperior and intereſting manner, of ſinging tender airs, and of compoſing agreeable couplets, ſoon procured him a great number of friends, and many of theſe of the firſt rank. He aſked permiſſion to accompany a celebrated miniſter who was baniſhed in 1757; but though ſuch diſintereſted attachment was highly admired, he was only allowed to go every year to expreſs his gratitude to him in his retreat. He was never aſhamed of the poverty of his relations, but aſſiſted them and brought them forward by his influence at corut. He had been at firſt a fencing-maſter; and it is ſaid that he foreſaw he would be obliged to employ his ſword in defence of his works. Moſt of them needed not this precaution. The principal are, 1. *Eſſai ſur la neceſſité et ſur les moyens de plaire*, in 12mo. This production is written in a lively ingenious manner, is full of excellent maxims, and has gone through many editions. In the preſent age, a greater ſhare of argument would be expected; but the chief merit of the work is, that, unlike the productions of many moraliſts, it contains nothing which the author himſelf did not reduce to practice. He had made it his ſtudy to contribute to the delight and amuſement of thoſe reſpectable ſocieties into which he was admitted. 2. *Les Ames rivales*, an agreeable little romance, in which there occur ſeveral ingenious obſervations on French manners; the *Abderites*, a comedy of but ordinary merit: *Poeſies diverſes*, full of delicacy (his *Romances* and his *Rajeuniſſement inutile* are particularly diſtinguiſhed for ſmooth verſification, elegant reflections, and pleaſing narration); and ſome diſſertations which diſplay conſiderable wit and information. Theſe pieces are to be found in the miſcellaneous works of the author, publiſhed at Paris 1743, in 12mo. 3. Some little pieces of one act; which make part of different operas, called the *Fragmens*, *Zelindor*, *Iſmene Almaſis*, the *Genius tutelaires*, and the *Sibylle*. He was devoted to lyric poetry, and cultivated it with ſucceſs. In this ſpecies of writing we have from his pen the *Empire de l'Amour*, a ballet; the *Trophee*; the *Ames reunis*, a ballet which was never acted; and *Eroſine*, a heroic paſtoral. 4. *L'Hiſtoire des Chats*, a trifling performance, too ſeverely cenſured at the time, and now almoſt wholly fallen into oblivion. This work gave the Comte d'Argenſon an opportunity of being witty at the author's expence. When Voltaire retired into Pruſſia, Moncrif applied to the miniſter for the vacant place of hiſtoriographer: "*Hiſtiographe!* (ſaid the Comte d'Argenſon), vous voulez ſans doute dire hiſtoriogriphe." His works were collected, in 1761, into 4 vols, 12mo.

MONDA, or Munda (anc. geog.), a river of Luſitania, running midway from eaſt to weſt into the Atlantic, between the Durius and Tagus, and waſhing Conimbrica. Now the *Mondego*, a river of Portugal, which running by Coimbra, falls into the Atlantic, 30 miles below it.

MONDAY, the ſecond day of the week, ſo called as being anciently ſacred to the moon; *q. d.* moon-day.

MONDOVI, a conſiderable town of Italy, in Piedmont; with a citadel, univerſity, and biſhop's ſee. It is the largeſt and moſt populous town of Piedmont, and is ſeated in E. Long. 8. 15. N. Lat. 44. 23.

MONEMUGI, an empire in the ſouth of Africa, has Zanguebar on the eaſt, Monomotapa on the ſouth, Motamba and Makoko on the weſt, and Abyſſinia on the north and partly to the eaſt, though its boundaries that way cannot be aſcertained. It is divided into the kingdoms of Mujaco, Makoko or Anko, Gingiro, Cambate, Alaba, and Monemugi Proper. This laſt lies in the middle of the torrid zone, and about the equinoctial line ſouth of Makoko, weſt of Zanguebar, north of Monomotopa, and eaſt of Congo and of the northern parts of Monomotopa. To aſcertain its extent, is too difficult a taſk, being a country ſo little frequented. The country known, abounds with gold, ſilver, copper mines, and elephants. The natives clothe themſelves in ſilks and cottons, which they buy of ſtrangers and wear collars of tranſparent amber-beads, brought them from Cambaya: which beads ſerve alſo inſtead of money; gold and ſilver being too common, and of little value among them.

Their monarch always endeavours to be at peace with the princes round about him, and to keep an open trade with Quitoa, Melinda, and Mombaza, on the eaſt, and with Congo on the weſt; from all which places the black merchants reſort thither for gold. The Portugueſe merchants report, that on the eaſt ſide of Monemugi there is a great lake full of ſmall iſlands, abounding with all ſorts of fowl and cattle, and inhabited by negroes. They relate alſo, that on the main-land eaſtward they heard ſometimes the ringing of bells, and that one could obſerve buildings very much like churches; and that from theſe parts came men of a brown and tawny complexion, who traded with thoſe iſlanders, and with the people of Monemugi.

This country of Monemugi affords alſo abundance of palm-wine and oil, and ſuch great plenty of honey, that above half of it is loſt, the blacks not being able to conſume it. The air is generally very unwholeſome, and exceſſively hot, which is the reaſon why no Chriſtians undertake to travel in this empire. De Liſle gives the diviſion of this country as follows: The Maracates, the Meſſeguaries, the kingdom of the Buengas, the kingdom of Maſti, and that of Maravi. But we are not acquainted with any particulars relating to theſe nations or kingdoms.

MONETARIUS, or Moneyer, a name which antiquaries and medaliſts give to thoſe who ſtruck the ancient coins or monies.

Many of the old Roman, &c. coins have the name of the *monetarius*, either written at length or at leaſt the initial letters of it. See Medal.

Money.

MONEY, a piece of matter, commonly metal, to which public authority has affixed a certain value and weight to ſerve as a medium in commerce. See Coin, Commerce, and Medals; alſo the article Bank.

Money is uſually divided into *real* or *effective*, and *imaginary*, or *money of account*.

I. *Real Money*.

1. *Hiſtory of real Money*. Real money includes all coins, or ſpecies of gold, ſilver, copper, and the like; which have courſe in common, and do really exiſt. Such are guineas, piſtoles, pieces of eight, ducats, &c.

Real money, civilians obſerve, has three eſſential qualities, *viz*. matter, form, and weight or value.

For the matter, copper is that thought to have been firſt coined; afterwards ſilver; and laſtly gold, as being the moſt beautiful, ſcarce, cleanly, diviſible, and pure of all metals.

The degrees of goodneſs are expreſſed in gold by carats; and in ſilver by pennyweights, &c. For there are ſeveral reaſons for not coining them pure and without alloy, *viz*. the great loſs and expence in refining them, the neceſſity of hardening them to make them more durable, and the ſcarcity of gold and ſilver in moſt countries. See Alloy.

Among the ancient Britons, iron rings, or as ſome ſay, iron plates were uſed for money; among the Lacedemonians, iron bars quenched with vinegar, that they might not ſerve for any other uſe. Seneca obſerves, that there was anciently ſtamped money of leather, *corium forma publica impreſſum*. And the ſame thing was put in practice by Frederic II. at the ſiege of Milan; to ſay nothing of an old tradition among ourſelves, that in the confuſed times of the barons wars the like was done in England: but the Hollanders, we know, coined great quantities of paſteboard in the year 1574.

As to the form of money, it had been more various than the matter. Under this are comprehended the weight, figure, impreſſion, and value.

For the impreſſion, the Jews, though they deteſted images, yet ſtamped on the one ſide of their ſhekel the golden pot which had the manna, and on the other Aaron's rod. The Dardans ſtamped two cocks fighting. The Athenians ſtamped their coins with an owl, or an ox; whence the proverb on bribed lawyers, *Bos in lingua*. They of Ægina, with a tortoiſe; whence that other ſaying, *Virtutem et ſapientiam vincunt teſtudines*. Among the Romans, the monetarii ſometimes impreſſed the images of men that had been eminent in their families on the coins: but no living man's head was ever ſtamped on a Roman coin till after the fall of the commonwealth. From that time they bore the emperor's head on one ſide. From this time the practice of ſtamping the prince's image on coins has obtained among all civilized nations; the Turks and other Mahometans alone excepted, who, in deteſtation of images, inſcribe only the prince's name, with the year of the tranſmigration of their prophet.

As to the figure it is either round, as in Britain; multangular or irregular, as in Spain; ſquare, as in ſome parts of the Indies; or nearly globular, as in moſt of the reſt.

After the arrival of the Romans in Britain, the Britons imitated them, coining both gold and ſilver with the images of their kings ſtamped on them. When the Romans had ſubdued the kings of the Britons, they alſo ſuppreſſed their coins, and brought in their own; which were current there from the time of Claudius to that of Valentinian the younger, about the ſpace of 500 years.

Money.

Mr Camden obſerves, that the moſt ancient Engliſh coin he had known was that of Ethelbert king of Kent, the firſt Chriſtian king in the iſland: in whoſe time all money-accounts begin to paſs by the names of *pounds*, *ſhillings*, *pence*, and *mancuſes*. Pence ſeems borrowed from the Latin *pecunia*, or rather from *pendo*, on account of its juſt weight, which was about threepence Sterling. Theſe were coarſely ſtamped with the king's image on the one ſide, and either the mint-maſter's, or the city's where it was coined, on the other. Five of theſe pence made their ſhilling, probably ſo called from *ſcilingus*, which the Romans uſed for the fourth part of an ounce. Forty of theſe ſcillings made their pound: and 400 of theſe pounds were a legacy, or a portion for a king's daughter, as appears by the laſt will of king Alfred. By theſe names they tranſlated all ſums of money in their old Engliſh teſtament; talents by *pundes*; Judas's thirty pieces of ſilver by *thirtig ſcillinga*; tribute-money, by *penining*; the mite by *feorthling*.

But it muſt be obſerved, that they had no other real money, but pence only; the reſt being imaginary moneys, *i. e*. names of numbers or weights. Thirty of theſe pence made a mancus, which ſome take to be the ſame with a mark; manca, as appears by an old MS. was *quinta pars unciæ*. Theſe mancas or mancuſes were reckoned both in gold and ſilver. For in the year 680 we read that Ina king of the Weſt Saxons obliged the Kentiſhmen to buy their peace at the price of 30,000 mancas of gold. In the notes on King Canute's laws, we find this diſtinction, that *mancuſa* was as much as a mark of ſilver; and *manca* a ſquare piece of gold, valued at 30 pence.

The Danes introduced a way of reckoning money by ores, *per oras*; mentioned in Domeſday-book; but whether they were a ſeveral coin, or a certain ſum, does not plainly appear. This however, may be gathered from the Abbey-book of Burton, that 20 ores were equivalent to two marks. They had alſo a gold coin called *byzantine*, or *bezant*, as being coined at Conſtantinople, then called *Byzantium*. The value of which coin is not only now loſt, but was ſo entirely forgot even in the time of King Edward III. that whereas the biſhop of Norwich was fined a byzantine of gold to be paid the abbot of St Edmund's Bury for infringing his liberties (as it had been enacted by parliament in the time of the conqueror), no man then living could tell how much it was: ſo it was referred to the king to rate how much he ſhould pay. Which is the more unaccountable, becauſe but 100 years before, 200,000 bezants were exacted by the ſoldan for the ranſom of St Louis of France; which were then valued at 100,000 livres.

Though the coining of money be a ſpecial prerogative of the king, yet the ancient Saxon princes communicated it to their ſubjects; inſomuch that in every good town there was at leaſt one mint; but at London

don eight; at Canterbury four for the king, two for the archbiſhop, one for the abbot at Wincheſter, ſix at Rocheſter, at Haſtings two, &c.

The Norman kings continued the ſame cuſtom of coining only pence, with the prince's image on one ſide, and on the other the name of the city where it was coined, with a croſs ſo deeply impreſſed, that it might be eaſily parted and broke into two halves, which, ſo broken, they called *halfpence*; or into four parts, which they called *fourthings* or *farthings*.

In the time of King Richard I. money coined in the eaſt parts of Germany came in ſpecial requeſt in England on account of its purity, and was called *eaſterling money*, as all the inhabitants of thoſe parts were called *Eaſterlings*. And ſhortly after ſome of thoſe people ſkilled in coining were ſent for hither to bring the coin to perfection; which ſince has been called *ſterling* for *Eaſterling*. See STERLING.

King Edward I. who firſt adjuſted the meaſure of an ell by the length of his arm, herein imitating Charles the Great, was the firſt alſo who eſtabliſhed a certain ſtandard for the coin, which is expreſſed to this effect by Greg. Rockley, mayor of London, and mint maſter.—"A pound of money containeth twelve ounces: in a pound there ought to be eleven ounces, two eaſterlings, and one farthing; the reſt alloy. The ſaid pound ought to weigh twenty ſhillings and three pence in account and weight. The ounce ought to weigh twenty pence, and a penny twenty four grains and a half. Note, that eleven ounces two-pence Sterling ought to be of pure ſilver, called *leaf-ſilver*; and the minter muſt add of other weight ſeventeen-pence half-penny farthing, if the ſilver be ſo pure."

About the year 1320, the States of Europe firſt began to coin gold; and among the reſt, King Edward III. The firſt pieces he coined were called *florences*, as being coined by Florentines; afterwards he coined nobles; then roſe-nobles, current at 6s. and 8d. half-nobles called *half-pennies*, at 3 s. and 4d. of gold; and quarters at 20d. called *farthings of gold*. The ſucceeding kings coined roſe-nobles, and double roſe-nobles, great ſovereigns, and half Henry nobles, angels, and ſhillings.

King James I. coined units, double crowns, Britain crowns; then crowns, half-crowns, &c.

2. *Comparative value of Money and Commodities at different periods.* The Engliſh money, though the ſame names do by no means correſpond with the ſame quantity of precious metal as formerly, has not changed ſo much as the money of moſt other countries. From the time of William the Conqueror, the proportion between the pound, the ſhilling, and the penny, ſeems to have been uniformly the ſame as at preſent.

Edward III. as already mentioned, was the firſt of the Engliſh Kings that coined any gold; and no copper was coined by authority before James I. Theſe pieces were not called farthings, but *farthing tokens*, and all people were at liberty or take or refuſe them. Before the time of Edward III. gold was exchanged, like any other commodity, by its weight; and before the time of James I. copper was ſtamped by any one perſon who choſe to do it.

In the year 612 and 727, an ewe and lamb were rated at 1 s. Saxon money till a fortnight after Eaſter. Between the years 900 and 1000, two hydes of land, each containing about 120 acres, were ſold for 100 ſhillings. In 1000, by King Ethelred's laws, a horſe was rated at 30s. a mare, or a colt of a year old, at 20s. a mule, or young aſs, at 12 s. an ox at 30 s. a cow at 24 s. a ſwine at 8 d. a ſheep at 1 s. In 1043, a quarter of wheat was ſold for 60 d. Hence it is computed, that in the Saxon times there was ten times leſs money in proportion to commodities, than at preſent. Their nominal ſpecie, therefore being about three times higher than ours, the price of every thing, according to our preſent language, muſt be reckoned thirty times cheaper than it is now.

In the reign of William the Conqueror, commodities were ten times cheaper than they are at preſent; from which we cannot help forming a very high idea of the wealth and power of that king: for his revenue was L. 400,000 per annum, every pound being equal to that weight of ſilver, conſequently the whole may be eſtimated at L. 1,200,000 of the preſent computation; a ſum which, conſidering the different value of money between that period and the preſent, was equivalent to L. 12,000,000 of modern eſtimation.

The moſt neceſſary commodities do not ſeem to have advanced their price from William the Conqueror to Richard I.

The price of corn in the reign of Henry III. was near half the mean prince in our times. Biſhop Fleetwood has ſhown, that in the year 1240, which was in this reign, L. 4 : 13 : 9, was worth about L. 50 of our preſent money. About the latter end of this reign, Robert de Hay, rector of Souldern, agreed to receive 100 s. to purchaſe to himſelf and ſucceſſor the annual rent of 5 s. in full compenſation of an acre of corn.

Butchers meat, in the time of the great ſcarcity in the reign of Edward II. was, by a parliamentary ordinace, ſold three times cheaper than our mean price at preſent; poultry ſomewhat lower, becauſe being now conſidered as a delicacy, it has riſen beyond its proportion. The mean price of corn at this period was half the preſent value, and the mean price of cattle one-eight.

In the next reign, which was that of Edward III. the moſt neceſſary commodities were in general about three or four times cheaper than they are at preſent. In thoſe times, knights, who ſerved on horſeback in the army, had 2 s. a day, and a foot archer 6 d. which laſt would now be equal to a crown a day. This pay has continued nearly the ſame nominally (only that in the time of the commonwealth the pay of the horſe was advanced to 2 s. 6d. and that of the foot to 1s. though it was reduced again at the Reſtoration), but ſoldiers were proportionably of a better rank formerly.

In the time of Henry VI. corn was about half its preſent value, other commodities much cheaper. Biſhop Fleetwood has determined, from a moſt accurate conſideration of every circumſtance, that L. 3 in this reign was equivalent to L. 28 or L. 30 now.

In the time of Henry VII. many commodities were three times as cheap here, and in all Europe, as they are at preſent, there having been a great increaſe of gold and ſilver in Europe ſince his time, occaſioned by the diſcovery of America.

The commodities whoſe price has riſen the moſt ſince before the time of Henry VII. are butchers meat, fowls, and fiſh, eſpecially the latter. And the reaſon why corn was always much dearer in proportion to other eatables, according to their prices at preſent, is, that in early times agriculture was little underſtood. It required more labour and expence, and was more precarious, than it is at preſent. Indeed notwithſtanding the high price of corn in the times we are ſpeaking of, the raiſing of it ſo little anſwered the expence, that agriculture was almoſt univerſally quitted for graſing; which was more profitable, notwithſtanding the low price of butchers meat. So that there was conſtant occaſion for ſtatutes to reſtrain graſing, and to promote agriculture; and no effectual remedy was found till the bounty upon the exportation of corn; ſince which, about ten times more corn has been raiſed in this country than before.

The price of corn in the time of James I. and conſequently that of other neceſſaries of life, was not lower, but rather higher, than at preſent; wool is now two thirds of the value it was then; the finer manufactures having ſunk in price by the progreſs of art and induſtry, notwithſtanding the increaſe of money. Butchers meat was higher than at preſent. Prince Henry made an allowance of near 4d. per pound for all the beef and mutton uſed in his family. This may be true with reſpect to London; but the price of butchers meat in the country, which does not even now much exceed this price at a medium, has certainly greatly increaſed of late years, and particularly in the northern counties.

The prices of commodities are higher in England than in France; beſides that the poor people of France live upon much leſs than the poor in England, and their armies are maintained at leſs expence. It is computed by Mr Hume, that a britiſh army of 20,000 men is maintained at near as great an expence as 60,000 in France, and that the Engliſh fleet, in the war of 1741, required as much money to ſupport it as all the Roman legions in the time of the emperors. However, all that we can conclude from this is, that money is much more plentiful in Europe at preſent than it was in the Roman empire.

In the 13th century the common intereſt which the Jews had for their money, Voltaire ſays, was 20 per cent. But with regard to this, we muſt conſider the great contempt that nation was always held in, the large contributions they were frequently obliged to pay, the riſk they run of never receiving the principal, the frequent confiſcations of all their effects, and the violent perſecutions to which they were expoſed; in which circumſtances it was impoſſible for them to lend money at all unleſs for moſt extravagant intereſt, and much diſproportioned to its real value. Before the diſcovery of America and the plantation of the colonies, the intereſt of money was generally 12 per cent. all over Europe; and it has been growing gradually leſs ſince that time, till it is now generally about four or five.

When ſums of money are ſaid to be raiſed by a whole people, in order to form a juſt eſtimate of it we muſt take into conſideration not only the quantity of the precious metal according to the ſtandard of the coin, and the proportion of the quantity of coin to the commodities, but alſo the number and riches of the people who raiſe it; for populous and rich countries will much more eaſily raiſe any certain ſum of money than one that is thinly inhabited, and chiefly by poor people. This circumſtance greatly adds to our ſurpriſe at the vaſt ſums of money raiſed by William the Conqueror, who had a revenue nearly in value equal to L.12,000,000 of our money (allowance being made for the ſtandard of coin and the proportion it bore to commodities), from a country not near ſo populous or rich as England is at preſent. Indeed, the accounts hiſtorians give us of the revenues of this prince, and the treaſure he left behind him, are barely credible.

II. *Imaginary Money* or *Money of account*, is that which has never exiſted, or at leaſt which does not exiſt in real ſpecie, but is a denomination invented or retained to facilitate the ſtating of accounts, by keeping them ſtill on a fixed footing, not to be changed, like current coins, which the authority of the ſovereign raiſes or lowers according to the exigencies of the ſtate. Of which kind are pounds, livres, marks, maravedies, &c. See the annexed Table, where the fictitious money is diſtinguiſhed by a dagger (†).

Moneys of Account among the Ancients.— 1. The Grecians reckoned their ſums of money by *drachmæ*, *minæ*, and *talenta*. The drachma was equal to $7\frac{3}{4}$ d. Sterling; 100 drachmæ made the mina, equal to 3*l.* 4*s.* 7*d.* Sterling; 60 minæ made the talent, equal to 193*l.* 15*s.* Sterling; hence 100 talents mounted to 19,375*l.* Sterling. The mina and talentum, indeed, were different in different provinces: their proportions in Attic drachms are as follow. The Syrian mina contained 25 Attic drachms; the Ptolemaic $33\frac{1}{3}$; the Antiochic and Eubæan 100; the Babylonic 116; the greater Attic and Tyrian $133\frac{1}{3}$; the Æginean and Rhodian $166\frac{2}{3}$. The Syrian talent contained 15 Attic minæ; the Ptolemaic 20; the Antiochic 60; the Eubæan 60; the Babylonic 70; the greater Attic and Tyrian 80; the Æginean and Rhodian 100.

2. Roman moneys of account were the *ſeſtertius* and *ſeſtertium*. The ſeſtertius was equal to 1*d.* $3\frac{3}{4}$*q.* Sterling. One thouſand of theſe made the ſeſtertium, equal to 8*l.* 1*s.* 5*d.* 2*q.* Sterling. One thouſand of theſe ſeſtertia made the decies ſeſtertium (the adverb. *centies* being always underſtood) equal to 8072*l.* 18*s.* 4*d.* Sterling. The decies ſeſtertium, they alſo called *decies centena millia nummum.* Centies ſeſtertium, or centies HS, were equal to 80,729*l.* 3*s.* 4*d.* Millies HS to 807,291*l.* 13*s.* 4*d.* Millies centies HS to 888,020*l.* 16*s.* 8*d.*

THEORY OF MONEY.

1. *Of Artificial or Material Money.*

I. As far back as our accounts of the tranſactions of mankind reach, we find they had adopted the precious metals, that is, ſilver and gold, as the common meaſure of value, and as the adequate equivalent for every thing alienable.

The metals are admirably adapted for this purpoſe: they are perfectly homogeneous? when pure, their maſſes, maſs, or bulks, are exactly in proportion to their weights: no phyſical difference can be found between two pounds of gold, or ſilver, let them be the production of the mines of Europe; Aſia, Africa, or America; they are perfectly malleable, fuſible, and ſuffer the moſt exact diviſion which human art is capable to give them; they are capable of being mixed with one another, as well as with metals of a baſer, that is, of a leſs homogeneous nature, ſuch as copper; by this mixture they ſpread themſelves uniformly through the whole maſs of the compoſed lump, ſo that every atom of it becomes proportionally poſſeſſed of a ſhare of this noble mixture; by which means the ſubdiviſion of the precious metals is rendered very extenſive.

Their phyſical qualities are invariable; they loſe nothing by keeping; they are ſolid and durable; and though their parts are ſeparated by friction, like every other thing, yet ſtill they are of the number of thoſe which ſuffer leaſt by it.

If money, therefore, can be made of any thing, that is, if the proportional value of things vendible can be meaſured by any thing material, it may be meaſured by the metals.

II. The two metals being pitched upon as the moſt proper ſubſtances for realiſing the ideal ſcale of money, thoſe who undertake the operation of adjuſting a ſtandard, muſt conſtantly keep in their eye the nature and qualities of a ſcale, as well as the principles upon which it is formed.

The unit of the ſcale muſt conſtantly be the ſame, although realiſed in the metals, or the whole operation fails in the moſt eſſential part. This realiſing the unit is like adjuſting a pair of compaſſes to a geometrical ſcale, where the ſmalleſt deviation from the exact opening once given muſt occaſion an incorrect meaſure. The metals, therefore, are to money what a pair of compaſſes is to a geometrical ſcale.

This operation of adjuſting the metals to the money of account implies an exact and determinate proportion of both metals to the money-unit, realiſed in all the ſpecies and denominations of coin, adjuſted to that ſtandard.

The ſmalleſt particle of either metal added to, or taken away from, any coins, which repreſent certain determinate parts of the ſcale, overturns the whole ſyſtem of material money. And if, notwithſtanding ſuch variation, theſe coins continue to bear the ſame denominations as before, this will as effectually deſtroy their uſefulneſs in meaſuring the value of things, as it would overturn the uſefulneſs of a pair of compaſſes, to ſuffer the opening to vary, after it is adjuſted to the ſcale repreſenting feet, toiſes, miles or leagues, by which the diſtances upon the plan are to be meaſured.

III. Debaſing the ſtandard is a good term; becauſe it conveys a clear and diſtinct idea. It is diminiſhing the weight of the pure metal contained in that denomination by which a nation reckons, and which we have called the *money-unit*. Raiſing the ſtandard requires no farther definition, being the direct contrary.

IV. Altering the ſtandard (that is, raiſing or debaſing the value of the money-unit) is like altering the national meaſures of weights. This is beſt diſcovered by comparing the thing altered with things of the ſame nature which have ſuffered no alteration. Thus, if the foot of meaſure was altered at once over all England, by adding to it, or taking from it, any proportional part, of its ſtandard length, the alteration would be beſt diſcovered by comparing the new foot with that of Paris, or of any other country, which had ſuffered no alteration. Juſt ſo, if the pound Sterling, which is the Engliſh unit, ſhall be found any how changed, and if the variation it has met with be difficult to aſcertain becauſe of a complication of circumſtances, the beſt way to diſcover it, will be to compare the former and the preſent value of it with the money of other nations which has ſuffered no variation. This the courſe of exchange will perform with the greateſt exactneſs.

V. Artiſts pretend, that the precious metals, when abſolutely pure from any mixture, are not of ſufficient hardneſs to conſtitute a ſolid and laſting coin. They are found alſo in the mints mixed with other metals of a baſer nature; and the bringing them to a ſtate of perfect purity occaſions an unneceſſary expence. To avoid, therefore, the inconvenience of employing them in all their purity, people have adopted the expedient of mixing them with a determinate proportion of other metals, which hurts neither their fuſibility, malleability, beauty, or luſtre. This metal is called *alloy*; and, being conſidered only as a ſupport to the principal metal, is accounted of no value in itſelf. So that eleven ounces of gold, when mixed with one ounce of ſilver acquires, by that addition no augmentation of value whatever.

This being the caſe, we ſhall, as much as poſſible, overlook the exiſtence of alloy, in ſpeaking of money in order to render language leſs ſubject to ambiguity.

2. *Incapacities of the Metals to perform the office of an invariable Meaſure of Value.*

I. Were there but one ſpecies of ſuch a ſubſtance as we have repreſented gold and ſilver to be; were, there but one metal poſſeſſing the qualities of purity, diviſibility, and durability; the inconveniences in the uſe of it for money would be fewer by far than they are found to be as matters ſtand.

Such a metal might then, by an unlimited diviſion into parts exactly equal, be made to ſerve as a tolerably ſteady and univerſal meaſure. But the rivalſhip between the metals, and the perfect equality which is found between all their phyſical qualities, ſo far as regards purity and diviſibility, render them ſo equally well adapted to ſerve as the common meaſure of value, that they are univerſally admitted to paſs current as money.

What is the conſequence of this? that the one meaſures the value of the other, as well as that of every other thing. Now the moment any meaſure begins to be meaſured by another, whoſe proportion to it is not phyſically, perpetually, and invariably the ſame, all the uſefulneſs of ſuch a meaſure is loſt. An example will make this plain.

A foot of meaſure is a determinate length. An Engliſh foot may be compared with the Paris foot, or with that of the Rhine; that is to ſay, it may be meaſured by them; and the proportion between their lengths may be expreſſed in numbers; which proportion will be the ſame perpetually. The meaſuring the one by the other will occaſion no uncertainty; and we may ſpeak of length by Paris feet, and be perfectly well underſtood by others who are uſed to meaſure by the Engliſh foot, or by the foot of the Rhine.

But ſuppoſe that a youth of 12 years old takes it into his head to meaſure from time to time, as he advances in age, by the length of his own foot, and that he divides this growing foot into inches and decimals: what can be learned from his account of meaſures? As he increaſes in years, his foot, inches, and ſubdiviſions, will be gradually lengthening; and were every man to follow his example, and meaſure by his own foot, then the foot of a meaſure now eſtabliſhed would totally ceaſe to be of any utility.

This is juſt the caſe with the two metals. There is no determinate invariable proportion between their value; and the conſequence of this is, that when they are both taken for meaſuring the value of other things, the things to be meaſured, like lengths to be meaſured by the young man's foot, without changing their relative proportion between themſelves, change, however, with reſpect to the denominations of both their meaſures. An example will make this plain.

Let us ſuppoſe an ox to be worth 3000 pounds weight of wheat, and the one and the other to be worth an ounce of gold, and an ounce of gold to be worth exactly 15 ounces of ſilver: if the caſe ſhould happen, that the proportional value between gold and ſilver ſhould come to be as 14 is to one, would not the ox, and conſequently the wheat, be eſtimated at leſs in ſilver, and more in gold, than formerly? Farther, would it be in the power of any ſtate to prevent this variation in the meaſure of the value of oxen and wheat, without putting into the unit of their money leſs ſilver and more gold than formerly?

If therefore any particular ſtate ſhould fix the ſtandard of the unit of their money to one ſpecies of the metals, while in fact both the one and the other are actually employed in meaſuring value; does not ſuch a ſtate reſemble the young man who meaſures all by his growing foot? For if ſilver, for example, be retained as the ſtandard, while it is gaining upon gold one fifteenth additional value; and if gold continue all the while to determine the value of things as well as ſilver; it is plain, that, to all intents and purpoſes, this ſilver meaſure is lengthening daily like the young man's foot, ſince the ſame weight of it muſt become every day equivalent to more and more of the ſame commodity; notwithſtanding that we ſuppoſe the ſame proportion to ſubſiſt, without the leaſt variation, between that commodity and every other ſpecies of things alienable.

Buying and ſelling are purely conventional, and no man is obliged to give his merchandiſe at what may be ſuppoſed to be the proportion of its worth. The uſe, therefore, of an univerſal meaſure, is to mark, not only the relative value of the things to which it is applied as a meaſure, but to diſcover in an inſtant the proportion between the value of thoſe, and of every other commodity valued by a determinate meaſure in all the countries of the world.

Were pounds Sterling, livres, florins, piaſtres, &c. which are all money of account, invariable in their values, what a facility would it produce in all converſions, what an aſſiſtance to trade! But as they are all limited or fixed to coins, and conſequently vary from time to time, this example ſhows the utility of the invariable meaſure which we have deſcribed

There is another circumſtance which incapacitates the metals from performing the office of money; the ſubſtance of which the coin is made, is a commodity which riſes and ſinks in its value with reſpect to other commodities, according to the wants, competition, and caprices of mankind. The advantage, therefore, found in putting an intrinſic value into that ſubſtance which performs the function of money of account, is compenſated by the inſtability of that intrinſic value; and the advantage obtained by the ſtability of paper, or ſymbolical money, is compenſated by the defect it commonly has of not being at all times ſuſceptible of realization into ſolid property or intrinſic value.

In order, therefore, to render material money more perfect, this quality of metal, that is, of a commodity, ſhould be taken from it; and in order to render paper-money more perfect, it ought to be made to circulate upon metallic or land-ſecurity.

II. There are ſeveral ſmaller inconveniences accompanying the uſe of the metals, which we ſhall here ſhortly enumerate.

1mo, No money made of gold or ſilver can circulate long, without loſing its weight, although it all along preſerves the ſame denomination. This repreſents the contracting a pair of compaſſes which had been rightly adjuſted to the ſcale.

2do, Another inconvenience proceeds from the fabrication of money. Suppoſing the faith of princes who coin money to be inviolable, and the probity as well as capacity of thoſe to whom they commit the inſpection of the buſineſs of the metals to be ſufficient, it is hardly poſſible for workmen to render every piece exactly of a proper weight, or to preſerve the due proportion betweeen pieces of different denominations; that is to ſay, to make every ten ſixpences exactly of the ſame weight with every crown-piece and every five ſhillings ſtruck in a coinage. In proportion to ſuch inaccuracies, the parts of the ſcale become unequal.

3tio, Another inconvenience, and far from being inconſiderable, flows from the expence requiſite for the coining of money. This expence adds to its value as a manufacture, without adding any thing to its weight.

4to, The laſt inconvenience is, that by fixing the money of account entirely to the coin, without having any independent common meaſure, to mark and control theſe deviations from mathematical exactneſs, (which are either inſeparable from the metals themſelves, or from the fabrication of them), the whole meaſure of value, and all the relative intereſts of debtors and creditors, become at the diſpoſal not only of workmen in the mint, of Jews who deal in money, of clippers and waſhers in coin; but they are alſo entirely at the mercy of princes, who have the right of coinage, and who have frequently alſo the right of raiſing or debaſing the ſtandard of the coin, according as they find it moſt for their preſent and temporary intereſt.

3. *Methods which may be propoſed for leſſening the ſeveral Inconveniences to which material money is liable.*

The inconveniences from the variation in the relative value of the metals to one another, may in ſome meaſure be obviated by the following expedients.

1*mo*, By conſidering one only as the ſtandard, and leaving the other to ſeek its own value like any other commodity.

2*do*, By conſidering one only as the ſtandard, and fixing the value of the other from time to time by authority, according as the market-price of the metals ſhall vary.

3*tio*, By fixing the ſtandard of the unit according to the mean proportion of the metals, attaching it to neither; regulating the coin accordingly; and upon every conſiderable variation in the proportion between them, either to make a new coinage, or to raiſe the denomination of one of the ſpecies, and lower it in the other, in order to preſerve the unit exactly in the mean proportion between the gold and ſilver.

4*to*, To have two units and two ſtandards, one of gold and one of ſilver, and to allow every body to ſtipulate in either.

5*to*, Or laſt of all, to oblige all debtors to pay one half in gold, and one half in the ſilver ſtandard.

4. *Variations to which the Value of the Money-unit is expoſed from every Diſorder in the Coin.*

Let us ſuppoſe, at preſent, the only diſorder to conſiſt in a want of the due proportion between the gold and ſilver in the coin.

This proportion can only be eſtabliſhed by the market-price of the metals; becauſe an augmentation and riſe in the demand for gold or ſilver has the effect of augmenting the value of the metal demanded. Let us ſuppoſe, that to-day one pound of gold may buy fifteen pounds of ſilver: If to-morrow there be a high demand for ſilver, a competition among merchants to have ſilver for gold will enſue: they will contend who ſhall get the ſilver at the rate of 15 pounds for one of gold: this will raiſe the price of it; and in proportion to their views of profit, ſome will accept of leſs than the 15 pounds. This is plainly a riſe in the ſilver more properly than a fall in the gold; becauſe it is the competition for the ſilver which has occaſioned the variation in the former proportion between the metals.

Let us now ſuppoſe, that a ſtate, having with great exactneſs examined the proportion of the metals in the market, and having determined the preciſe quantity of each for realiſing or repreſenting the money-unit, ſhall execute a moſt exact coinage of gold and ſilver coin. As long as that proportion continues unvaried in the market, no inconvenience can reſult from that quarter in making uſe of metals for money of account.

But let us ſuppoſe the proportion to change; that the ſilver, for example, ſhall riſe in its value with regard to gold: will it not follow, from that moment, that the unit realized in the ſilver, will become of more value than the unit realized in the gold-coin?

But as the law has ordered them to paſs as equivalents for one another, and as debtors have always the option of paying in what legal coin they think fit, will they not chooſe to pay in gold? and will not then the ſilver coin be melted down or exported, in order to be ſold as bullion, above the value it bears when it circulates in coin? Will not this paying in gold alſo really diminiſh the value of the money-unit, ſince upon this variation every thing muſt ſell for more gold than before, as we have already obſerved.

Conſequently, merchandiſe, which have not varied in their relative value to any other thing but to gold and ſilver, muſt be meaſured by the mean proportion of the metals; and the application of any other meaſure to them is altering the ſtandard. If they are meaſured by the gold, the ſtandard is debaſed; if by ſilver, it is raiſed.

If, to prevent the inconvenience of melting down the ſilver, the ſtate ſhall give up affixing the value of their unit to both ſpecies at once, and ſhall fix it to one, leaving the other to ſeek its price as any other commodity; in that caſe, no doubt, the melting down of the coin will be prevented; but will this ever reſtore the value of the money-unit to its former ſtandard? Would it, for example, in the foregoing ſuppoſition, raiſe the debaſed value of the money-unit in the gold coin, if that ſpecies were declared to be the ſtandard? It would indeed render ſilver coin purely a merchandiſe, and, by allowing it to ſeek its value, would certainly prevent it from being melted down as before; becauſe the pieces would riſe conventionally in their denomination; or an *agio*, as it is called, would be taken in payments made in ſilver: but the gold would not, on that account, riſe in its value, or begin to purchaſe any more merchandiſe than before. Were therefore the ſtandard fixed to the gold, would not this be an arbitrary and a violent revolution in the value of the money-unit, and a debaſement of the ſtandard?

If, on the other hand, the ſtate ſhould fix the ſtandard to the ſilver, which we ſuppoſe to have riſen in its value, would that ever ſink the advanced value which the ſilver coin had gained above the worth of the former ſtandard unit? and would not this be a violent and an arbitrary revolution in the value of the money-unit, and a raiſing of the ſtandard?

The only expedient, therefore, is, in ſuch a caſe, to fix the numerary unit to neither of the metals, but to contrive a way to make it fluctuate in a mean proportion between them; which is in effect the introduction of a pure ideal money of account.

The regulation of fixing the unit by the mean proportion, ought to take place at the inſtant the ſtandard unit is fixed with exactneſs both to the gold and ſilver. If it be introduced long after the market-proportion between the metals has deviated from the proportion eſtabliſhed in the coin; and if the new regulation is made to have a retroſpect, with regard to the acquitting of permanent contracts entered into while the value of the money-unit had attached itſelf to the loweſt currency in conſequence of the principle above laid down; then the reſtoring the money-unit to that ſtandard where it ought to have remained (to wit, to the mean proportion) is an injury to all debtors who have contracted ſince the time that the proportion of the metals began to vary.

This is clear from the former reaſoning. The moment the market price of the metals differs from that in the coin, every one who has payments to make, pays in that ſpecies which is the higheſt rated in the coin; conſequently, he who lends, lends in that ſpecies. If after the contract, therefore, the unit is carried up to the mean proportion, this muſt be a loſs to him who had borrowed.

From this we may perceive, why there is leſs inconvenience from the varying of the proportion of the metals, where the ſtandard is fixed to one of them, than when it is fixed to both. In the firſt caſe, it is at leaſt uncertain whether the ſtandard or the merchandiſe ſpecies is to riſe; conſequently is is uncertain whether the debtors or the creditors are to gain by a variation. If the ſtandard ſpecies ſhould riſe, the creditors will gain; if the merchandiſe ſpecies riſes, the debtors will gain; but when the unit is attached to both ſpecies, then the creditors never can gain, let the metals vary as they will; if ſilver riſes, then debtors will pay in gold; if gold riſes, the debtors will pay in ſilver. But whether the unit be attached to one or to both ſpecies, the infallible conſequence of a variation is, that one half of the difference is either gained or loſt by debtors and creditors. The invariable unit is conſtantly the mean proportional between the two meaſures.

5. *How the Variations of the intrinſic Value of the Unit of Money muſt affect all the domeſtic Intereſt of a Nation.*

If the changing the content of the buſhel by which grain is meaſured, would affect the intereſt of thoſe who are obliged to pay, or who are entitled to receive a certain number of buſhels of grain for the rent of lands; in the ſame manner muſt every variation in the value of the unit of account affect all perſons who, in permanent contracts, are obliged to make payments, or who are obliged to receive ſums of money ſtipulated in multiples or in fractions of that money-unit.

Every variation, therefore, upon the intrinſic value of the money-unit, has the effect of benefiting the claſs of creditors at the expence of debtors, or *vice verſa*.

This conſequence is deduced from an obvious principle. Money is more or leſs valuable in proportion as it can purchaſe more or leſs of every kind of merchandiſe. Now, without entering anew into the cauſes of the riſe and fall of prices, it is agreed upon all hands, that whether an augmentation of the general maſs of money in circulation has the effect of raiſing prices in general, or not, any augmentation of the quantity of the metals appointed to be put into the money-unit, muſt at leaſt affect the value of that money-unit, and make it purchaſe more of any commodity than before: that is to ſay, 113 grains of fine gold, the preſent weight of a pound Sterling in gold, can buy 113 pounds of flour; were the pound Sterling raiſed to 114 grains of the ſame metal, it would buy 114 pounds of flour; conſequently, were the pound Sterling augmented by one grain of gold, every miller who paid a rent of ten pounds a-year, would be obliged to ſell 1140 pounds of his flour, in order to procure ten pounds to pay his rent, in place of 1130 pounds of flour, which he ſold formerly to procure the ſame ſum; conſequently, by this innovation, the miller muſt loſe yearly ten pounds of flour, which his maſter conſequently muſt gain. From this example, it is plain that every augmentation of metals put into the pound Sterling, either of ſilver or gold, muſt imply an advantage to the whole claſs of creditors who are paid in pounds Sterling, and conſequently muſt be a proportional loſs to all debtors who muſt pay by the ſame denomination.

6. *Of the Diſorder in the Britiſh Coin, ſo far as it occaſions the melting down or the exporting of the Specie.*

The defects in the Britiſh coin are three.

1*mo*, The proportion between the gold and ſilver is found to be as 1 to 15 $\frac{2}{10}$, whereas the market price may be ſuppoſed to be nearly as 1 to 14$\frac{1}{2}$.

2*do*, Great part of the current money is worn and light.

3*tio*, from the ſecond defect proceeds the third, to wit, that there are ſeveral currencies in circulation which paſs for the ſame value, without being of the ſame weight.

4*to*, From all theſe defects reſults the laſt and greateſt inconvenience, to wit, that ſome innovation muſt be made, in order to ſet matters on a right footing.

The Engliſh, beſides the unit of their money which they call the pound Sterling, have alſo the unit of their weight for weighing the precious metals.

This is called the *pound troy*, and conſiſts of 12 ounces, every ounce of 20 penny-weights, and every penny-weight of 24 grains. The pound troy, therefore, conſiſts of 240 penny-weights and 5760 grains.

The fineneſs of the ſilver is reckoned by the number of ounces and penny-weights of the pure metal in the pound troy of the compoſed maſs; or, in other words, the pound troy, which contains 5760 grains of ſtandard ſilver, contains 5328 grains of fine ſilver, and 432 grains of copper, called *alloy*.

Thus ſtandard ſilver is 11 ounces 2 penny-weights of fine ſilver in the pound troy to 18 penny-weights copper, or 111 parts fine ſilver to 9 parts alloy.

Standard gold is 11 ounces fine to 1 ounce ſilver or copper employed for alloy, which together make the pound troy; conſequently, the pound troy of ſtandard gold contains 5280 grains fine, and 480 grains alloy, which alloy is reckoned of no value.

This pound of ſtandard ſilver is ordered, by ſtatute of the 43d of Elizabeth, to be coined into 62 ſhillings, 20 of which make the pound ſterling; conſequently the 20 ſhillings contain 1718.7 grains of fine ſilver, and 1858.06 ſtandard ſilver.

The pound troy of ſtandard gold, $\frac{11}{12}$ fine, is ordered, by an act of king Charles II. to be cut into 44$\frac{1}{2}$ guineas; that is to ſay, every guinea contains 129.43 grains of ſtandard gold, and 118.644 of fine gold;

and the pound Sterling, which is $\frac{20}{21}$ of the guinea, contains 112.994, which we may ſtate at 113 grains of fine gold.

The coinage in England is entirely defrayed at the expence of the ſtate. The mint price for the metals is the very ſame with the price of the coin. Whoever carries to the mint an ounce of ſtandard ſilver, receives for it in ſilver coin 5 *s.* 2 d, or 62 *d.*: whoever carries an ounce of ſtandard gold receives in gold coin 3*l.* 17*s.* 10½*d.* the one and the other making exactly an ounce of the ſame fineneſs with the bullion. Coin, therefore, can have no value in the market above bullion; conſequently, no loſs can be incurred by thoſe who melt it down.

When the guinea was firſt ſtruck, the government (not inclining to fix the pound Sterling to the gold coin of the nation) fixed the guinea at 20 ſhillings, (which was then below its proportion to the ſilver), leaving it to ſeek its own price above that value, according to the courſe of the market.

By this regulation no harm was done to the Engliſh ſilver ſtandard; becauſe the guinea, or 118.644 grains fine gold being worth more, at that time, than 20 ſhillings, or 1718.7 grains fine ſilver, no debtor would pay with gold at its ſtandard value; and whatever it was received for above that price was purely conventional.

Accordingly guineas ſought their own price until the year 1728, then they were fixed a new, not below their value as at firſt, but at what was then reckoned their exact value, according to the proportion of the metals, *viz.* at 21 ſhillings; and at this they were ordered to paſs current in all payments.

This operation had the effect of making the gold a ſtandard as well as the ſilver. Debtors then paid indifferently in gold as well as in ſilver, becauſe both were ſuppoſed to be of the ſame intrinſic as well as current value; in which caſe no inconvenience could follow upon this regulation. But in time ſilver came to be more demanded: the making of plate began to prevail more than formerly, and the exportation of ſilver to the Eaſt Indies increaſing yearly, made the demand for it greater, or perhaps brought its quantity to be proportionably leſs than before. This changed the proportion of the metals; and by ſlow degrees they have come from that of 1 to 15.2 (the proportion they were ſuppoſed to have when the guineas were fixed and made a lawful money at 21 ſhillings) to that of 14.5, the preſent *ſuppoſed* proportion.

The conſequence of this has been, that the ſame guinea which was worth 1804.6 grains fine ſilver, at the time it was fixed at 21 s. is now worth no more than 1719.9 grains of fine ſilver according to the proportion of 14½ to 1.

Conſequently debtors, who have always the option of the legal ſpecies in paying their debts, will pay pounds ſterling no more in ſilver but in gold; and as the gold pounds they pay in are not intrinſically worth the ſilver pounds they paid in formerly according to the ſtatute of Eliſabeth, it follows that the pound Sterling in ſilver is really no more the ſtandard, ſince nobody will pay at that rate, and ſince nobody can be compelled to do it.

Beſides this want of proportion between the metals, the ſilver coined before the reign of George I. is now become light by circulation; and the guineas coined by all the princes ſince Charles II. paſs by tale, though many of them are conſiderably diminiſhed in their weight.

Let us now examine what profit the want of proportion and the want of weight in the coin can afford to the money-jobbers in melting it down or exporting it.

Did every body conſider coin only as the meaſure for reckoning value, without attending to its value as a metal, the deviations of gold and ſilver coin from perfect exactneſs, either as to proportion or weight, would occaſion little inconvenience.

Great numbers, indeed, in every modern ſociety, conſider coin in no other light than that of money of account; and have great difficulty to comprehend what difference any one can find between a light ſhilling and a heavy one, or what inconvenience there can poſſibly reſult from a guinea's being ſome grains of fine gold too light to be worth 21 ſhillings ſtandard weight. And did every one think in the ſame way, there would be no occaſion for coin of the precious metals at all; leather, copper, iron, or paper, would keep the reckoning as well as gold and ſilver.

But although there be many who look no farther than at the ſtamp on the coin, there are others whoſe ſole buſineſs it is to examine its intrinſic worth as a commodity, and to profit of every irregularity in the weight and proportion of metals.

By the very inſtitution of coinage, it is implied, that every piece of the ſame metal, and ſame denomination with regard to the money-unit, ſhall paſs current for the ſame value.

It is, therefore, the employment of money-jobbers, to examine, with a ſcrupulous exactneſs, the preciſe weight of every piece of coin which comes into their hands.

The firſt object of their attention is, the price of the metals in the market: a jobber finds, at preſent, that with 14.5 pounds of fine ſilver bullion, he can buy one pound of fine gold bullion.

He therefore buys up with gold coin all the new ſilver as faſt as it is coined, of which he can get at the rate of 15.2 pounds for one in gold; theſe 15.2 pounds ſilver coin he melts down into bullion, and converts that back into gold bullion, giving at the rate of only 14.5 pounds for one.

By this operation he remains with the value of $\frac{7}{10}$ of one pound weight of ſilver bullion clear profit upon the 15½ pounds he bought; which $\frac{7}{10}$ is really loſt by the man who inadvertently coined ſilver at the mint, and gave it to the money-jobber for his gold. Thus the ſtate loſes the expence of the coinage, and the public the convenience of change for their guineas.

But here it may be aſked, Why ſhould the money-jobber melt down the ſilver coin? can he not buy gold with it as well without melting it down? He cannot; becauſe when it is in coin he cannot avail himſelf of its being new and weighty. Coin goes by tale, not by weight; therefore, were he to come to market with his new ſilver coin, gold bullion being ſold at the mint price, we ſhall ſuppoſe, viz. at 3*l.* 17*s.* 10½*d.* Sterling money *per* ounce, he would be obliged to pay the price of what he brought with heavy money, which he can equally do with light.

He therefore melts down the new ſilver coin, and ſells it for bullion, at ſo many pence an ounce; the price of which bullion is, in the Engliſh market, always above the price of ſilver at the mint, for the reaſons now to be given.

When you ſell ſtandard-ſilver bullion at the mint, you are to be paid in weighty money: that is, you receive for your bullion the very ſame weight in ſtandard coin; the coinage coſt nothing; but when you ſell bullion in the market, you are paid in worn out ſilver, in gold, in bank-notes, in ſhort, in every ſpecies of lawful current money. Now all theſe payments have ſome defect: the ſilver you are paid with is worn and light; the gold you are paid with is over-rated, and perhaps alſo light; and the bank-notes muſt have the ſame value with the ſpecie with which the bank pays them; that is, with light ſilver or over-rated gold.

It is for theſe reaſons, that ſilver bullion, which is bought by the mint at *5s. 2d. per* ounce of heavy ſilver money, may be bought at market at 65 pence the ounce in light ſilver, over-rated gold, or bank-notes, which is the ſame thing.

Further, we have ſeen how the impoſition of coinage has the effect of raiſing coin above the value of bullion, by adding a value to it which it had not as a metal.

Juſt ſo, when the unit is once affixed to certain determined quantities of both metals, if one of the metals ſhould afterwards riſe in value in the market, the coin made of that metal muſt loſe a part of its value as coin, although it retains it as a metal. Conſequently, as in the firſt caſe it acquired an additional value by being coined, it muſt now acquire an additional value by being melted down. From this we may conclude, that when the ſtandard is affixed to both the metals in the coin, and when the proportion of that value is not made to follow the price of the market, that ſpecies which riſes in the market is melted down, and the bullion is ſold for a price as much exceeding the mint price as the metal has riſen in its value.

If, therefore, in England, the price of ſilver bullion is found to be at 65 pence the ounce, while at the mint it is rated at 62; this proves that ſilver has riſen $\frac{3}{62}$ above the proportion obſerved in the coin, and that all coin of ſtandard weight may conſequently be melted down with a profit of $\frac{3}{62}$. But as there are ſeveral other circumſtances to be attended to which regulate and influence the price of bullion, we ſhall here paſs them in review, the better to diſcover the nature of this diſorder in the Engliſh coin, and the advantages which money-jobbers may draw from it.

The price of bullion, like that of every other merchandiſe, is regulated by the value of the money it is paid with.

If bullion, therefore, ſells in England for 65 pence an ounce, paid in ſilver coin, it muſt ſell for 65 ſhillings the pound troy: that is to ſay, the ſhillings it is commonly paid with do not exceed the weight of $\frac{1}{65}$ of a pound troy; for if the 65 ſhillings with which the pound of bullion is paid weighed more than a pound troy, it would be a ſhorter and better way for him who wants bullion to melt down the ſhillings and make uſe of the metal, than to go to market with them in order to get leſs.

We may, therefore, be very certain, that no man will buy ſilver bullion at 65 pence an ounce, with any ſhilling which weighs above $\frac{1}{65}$ of a pound troy.

We have gone upon the ſuppoſition that the ordinary price of bullion in the Engliſh market is 65 pence *per* ounce. This has been done upon the authority of ſome late writers on this ſubject: it is now proper to point out the cauſes which may make it deviate from that value.

I. It may vary, and certainly will vary, in the price, according as the currency is better or worſe. When the expences of a war, or a wrong balance of trade, have carried off a great many heavy guineas, it is natural that bullion ſhould riſe; becauſe then it will be paid for more commonly in light gold and ſilver; that is to ſay, with pounds Sterling, below the value of 113 grains fine gold, the worth of the pound Sterling in new guineas.

II. This wrong balance of trade, or a demand for bullion abroad, becoming very great, may occaſion a ſcarcity of the metals in the market, as well as a ſcarcity of the coin; conſequently, an advanced price muſt be given for it in proportion to the greatneſs and height of the demand. In this caſe, both the ſpecie and the bullion muſt be bought with paper. But the riſe in the price of bullion proceeds from the demand for the metals and the competition between merchants to procure them, and not becauſe the paper given as the price is at all of inferior value to the ſpecie. The leaſt diſcredit of this kind would not tend to diminiſh the value of the paper: it would annihilate it at once. Therefore, ſince the metals muſt be had, and that the paper cannot ſupply the want of them when they are to be exported, the price riſes in proportion to the difficulties in finding metals elſewhere than in the Engliſh market.

III. A ſudden call for bullion, for the making of plate. A goldſmith can well afford to give 67 pence for an ounce of ſilver, that is to ſay, he can afford to give one pound of gold for 14 pounds of ſilver, and perhaps for leſs, notwithſtanding that what he gives be more than the ordinary proportion between the metals, becauſe he indemnifies himſelf amply by the price of his workmanſhip; juſt as a tavern-keeper will pay any price for a fine fiſh, becauſe, like the goldſmith, he buys for other people.

IV. The mint price has as great an effect in bringing down the price of bullion, as exchange has in raiſing it. In countries where the metals in the coin are juſtly proportioned, where all the currencies are of legal weight, and where coinage is impoſed, the operations of trade make the price of bullion conſtantly to fluctuate between the value of the coin and the mint price of the metals.

Now let us ſuppoſe that the current price of ſilver bullion in the market is 65 pence the ounce, paid in lawful money, no matter of what weight or of what metal. Upon this the money-jobber falls to work. All ſhillings which are above $\frac{1}{65}$ of a pound troy, he throws into his melting-pot, and ſells them as bullion for 65d. per ounce; all thoſe which are below that weight he carries to market, and buys bullion with them at 65d. per ounce.

What is the conſequence of this?

That thoſe who ſell the bullion, finding the ſhillings which the money-jobber pays with perhaps not above

$\frac{1}{66}$ of a pound troy, they on their ſide raiſe the price of their bullion to 66d. the ounce.

This makes new work for the money-jobber; for he muſt always gain. He now weighs all ſhillings as they come to hand; and as formerly he threw into his melting-pot thoſe only which were worth more than $\frac{1}{62}$ of a pound troy, he now throws in all that are in value above $\frac{1}{66}$. He then ſells the melted ſhillings at 66d. the ounce, and buys bullion with the light ones at the ſame price.

This is the conſequence of ever permitting any ſpecies of coin to paſs by the authority of the ſtamp, without controlling it at the ſame time by the weight: and this is the manner in which money jobbers gain by the currency of light money.

It is no argument againſt this expoſition of the matter to ſay, that ſilver bullion is ſeldom bought with ſilver coin; becauſe the pence in new guineas are worth no more than the pence of ſhillings of 65 in the pound troy: that is to ſay, that 240 pence contained in $\frac{20}{21}$ of a new guinea, and 240 pence contained in 28 ſhillings of 65 to the pound troy, differ no more on the intrinſic value than 0.83 of a grain of fine ſilver upon the whole, which is a mere trifle.

Whenever, therefore, ſhillings come below the weight of $\frac{1}{65}$ of a pound troy, then there is an advantage in changing them for new guineas; and when that is the caſe, the new guineas will be melted down, and profit will be found in ſelling them for bullion, upon the principles we have juſt been explaining.

We have already given a ſpecimen of the domeſtic operations of the money-jobbers; but theſe are not the moſt prejudicial to national concerns. The jobbers may be ſuppoſed to be Engliſhmen; and in that caſe the profit they make remains at home: but whenever there is a call for bullion to pay the balance of trade, it is evident that this will be paid in ſilver coin; never in gold, if heavy ſilver can be got; and this again carries away the ſilver coin, and renders it at home ſo rare, that great inconveniences are found for want of the leſſer denominations of it. The loſs however here is confined to an inconvenience; becauſe the balance of trade being a debt which muſt be paid, we do not conſider the exportation of the ſilver for that purpoſe as any conſequence of the diſorder of the coin. But beſides this exportation which is neceſſary, there are others which are arbitrary, and which are made only with a view to profit of the wrong proportion.

When the money-jobbers find difficulty in carrying on the traffic we have deſcribed, in the Engliſh market, becauſe of the competition among themſelves, they carry the ſilver coin of the country, and ſell it abroad for gold, upon the ſame principles that the Eaſt India company ſend ſilver to China in order to purchaſe gold.

It may be demanded, What hurt this trade can do to Britain, ſince thoſe who export ſilver bring back the ſame value in gold? Were this trade carried on by natives, there would be no loſs: becauſe they would bring home gold for the whole intrinſic value of the ſilver. But if we ſuppoſe foreigners ſending over gold to be coined at the Engliſh mint, and changing the gold into Engliſh ſilver coin, and then carrying off this coin, it is plain that they muſt gain the difference, as well as the money-jobbers. But it may be anſwered, That having given gold for ſilver at the rate of the mint, they have given value for what they have received. Very right; but ſo did Sir Hans Sloane, when he paid five guineas for an overgrown toad: he got value for his money: but it was value only to himſelf. Juſt ſo, whenever the Engliſh government ſhall be obliged to reſtore the proportion of the metals (as they muſt do), this operation will annihilate that imaginary value which they have hitherto ſet upon gold; which imagination is the only thing which renders the exchange of their ſilver againſt the foreign gold equal.

But it is farther objected, that foreigners cannot carry off the heavy ſilver; becauſe there is none to carry off. Very true; but then they have carried off a great quantity already; or if the Engliſh Jews have been too ſharp to allow ſuch a profit to fall to ſtrangers, (which may or may not have been the caſe), then this diſorder is an effectual ſtop to any more coinage of ſilver for circulation.

7. *Of the diſorder in the Britiſh Coin, ſo far as it affects the value of the Pound Sterling Currency.*

From what has been ſaid, it is evident, that there muſt be found in England two legal pounds Sterling of different values; the one worth 113 grains of fine gold, the other worth 1718.7 grains of fine ſilver. We call them different; becauſe theſe two portions of the precious metals are of different values all over Europe.

But beſides theſe two different pounds Sterling, which the change in the proportion of the metals have created, the other defects of the circulating coin produce ſimilar effects. The guineas coined by all the princes ſince king Charles II. have been of the ſame ſtandard weight and fineneſs, 44½ in a pound troy of ſtandard gold $\frac{11}{12}$ fine; theſe have been conſtantly wearing ever ſince they have been coined; and in proportion to their wearing they are of leſs value.

If therefore, the new guineas are below the value of a pound Sterling in ſilver, ſtandard weight, the old muſt be of leſs value ſtill. Here then is another currency, that is, another pound Sterling: or indeed more properly ſpeaking, there are as many different pounds Sterling as there are guineas of different weights. This is not all; the money-jobbers having carried off all the weighty ſilver, that which is worn with uſe and reduced even below the ſtandard of gold, forms one currency more, and totally deſtroys all determinate proportion between the money-unit and the currencies which are ſuppoſed to repreſent it.

It may be aſked, how, at this rate, any ſilver has remained in England? It is anſwered, that the few weighty ſhillings which ſtill remain in circulation, have marvellouſly eſcaped the hands of the money-jobbers: and as to the reſt, the rubbing and wearing of theſe pieces has done what the ſtate might have done; that is to ſay, it has reduced them to their due proportion with the lighteſt gold.

The diſorder, therefore, of the Engliſh coin has rendered the ſtandard of a pound Sterling quite uncertain. To ſay that it is 1718.7 grains of fine ſilver, is quite ideal. Who are paid in ſuch pounds? To ſay that it is 113 grains of pure gold, may alſo not be true; becauſe there are many currencies worſe than the new guineas.

What then is the conſequence of all this diſorder? What effect has it upon the current value of a pound Sterling? And which way can the value of that be determined?

The operations of trade bring value to an equation, notwithſtanding the greateſt irregularities poſſible; and ſo in fact a pound Sterling has acquired a determinate value over all the world by the means of foreign exchange. This is a kind of ideal ſcale for meaſuring the Britiſh coin, although it has not all the properties of that deſcribed above.

Exchange conſiders the pound Sterling as a value determined according to the combination of the values of all the different currencies, in proportion as payments are made in the one or the other; and as debtors generally take care to pay in the worſt ſpecies they can, it conſequently follows, that the value of the pound Sterling ſhould fall to that of the loweſt currency.

Were there a ſufficient quantity of worn gold and ſilver to acquit all bills of exchange, the pound Sterling would come down to the value of them; but if the new gold be alſo neceſſary for that purpoſe, the value of it muſt be proportionally greater.

All theſe combinations are liquidated and compenſated with one another, by the operations of trade and exchange: and the pound Sterling, which is ſo different in itſelf, becomes thereby, in the eyes of commerce a determinate unit; ſubject, however to variations, from which it never can be exempted.

Exchange therefore, is one of the beſt meaſures for valuing a pound Sterling, preſent currency. Here occurs a queſtion:

Does the great quantity of paper-money in England tend to diminiſh the value of the pound Sterling?

We anſwer in the negative. Paper money is juſt as good as gold or ſilver money, and no better. The variation of the ſtandard, as we have already ſaid, muſt influence the intereſts of debtors and creditors proportionably every where. From this it follows that all augmentation of the value of the money unit in the ſpecie muſt hurt the debtors in the paper money; and all diminutions, on the other hand, muſt hurt the creditors in the paper money as well as every where elſe. The payments, therefore, made in paper money, never can contribute to the regulation of the ſtandard of the pound Sterling; it is the ſpecie received in liquidation of that paper money which alone can contribute to mark the value of the Britiſh unit; becauſe it is affixed to nothing elſe.

From this we may draw a principle, "That in countries where the money-unit is entirely affixed to the coin, the actual value of it is not according to the legal ſtandard of that coin, but according to the mean proportion of the actual worth of theſe currencies in which debts are paid.

From this we ſee the reaſon why the exchange between England and all other trading towns in Europe has long appeared ſo unfavourable. People calculate the real par, upon the ſuppoſition that a pound Sterling is worth 1718.7 grains troy of fine ſilver, when in fact the currency is not perhaps worth 1638, the value of a new guinea in ſilver, at the market proportion of 1 to 14.5; that is to ſay, the currency is but 95.3 *per cent.* of the ſilver ſtandard of the 43d of Elizabeth. No wonder then if the exchange be thought unfavourable.

From the principle we have juſt laid down, we may gather a confirmation of what we advanced concerning the cauſe of the advanced price of bullion in the Engliſh market.

When people buy bullion with current money at a determinate price, that operation, in conjunction with the courſe of exchange, ought naturally to mark the actual value of the pound Sterling with great exactneſs.

If therefore the price of ſtandard bullion in the Engliſh market, when no demand is found for the exportation of the metals, that is to ſay, when paper is found for paper upon exchange, and when merchants verſed in theſe matters judge exchange (that is, remittances) to be at par, if then ſilver bullion cannot be bought at a lower price than 65 pence the ounce, it is evident that this bullion might be bought with 65 pence in ſhillings, of which 65 might be coined out of the pound troy Engliſh ſtandard ſilver; ſince 65 per ounce implies 65 ſhillings for the 12 ounces or pound troy.

This plainly ſhows how ſtandard ſilver bullion ſhould ſell for 65 pence the ounce, in a country where the ounce of ſtandard ſilver in the coin is worth no more than 62; and were the market-price of bullion to ſtand uniformly at 65 pence per ounce, that would ſhow the value of the pound Sterling to be tolerably fixed. All the heavy ſilver coin is now carried off; becauſe it was intrinſically worth more than the gold it paſſed for in currency. The ſilver therefore which remains is worn down to the market proportion of the metals, as has been ſaid; that is to ſay, 20 ſhillings in ſilver currency are worth 113 grains of fine gold, at the proportion of 1 to 14.5 between gold and ſilver. Now,

as 1 is to 14.5 ſo is 113 to 1638:

ſo the 20 ſhillings current weigh but 1638 grains fine ſilver, inſtead of 178.7, which they ought to do according to the ſtandard.

Now let us ſpeak of ſtandard ſilver, ſince we are examining how far the Engliſh coin muſt be worn by uſe.

The pound troy contains 5760 grains. This according to the ſtandard, is coined into 62 ſhillings: conſequently, every ſhilling ought to weigh 92.9 grains. Of ſuch ſhillings it is impoſſible that ever ſtandard bullion ſhould ſell at above 62 pence per ounce. If therefore ſuch bullion ſells for 65 pence, the ſhillings with which it is bought muſt weigh no more than 88.64 grains ſtandard ſilver; that is, they muſt loſe 4.29 grains, and are reduced to $\frac{1}{65}$ of a pound troy.

But it is not neceſſary that bullion be bought with ſhillings; no ſtipulation of price is ever made farther than as ſo many pence Sterling per ounce. Does not this virtually determine the value of ſuch currency with regard to all the currencies in Europe? Did a Spaniard, a Frenchman, or a Dutchman, know the exact quantity of ſilver bullion which can be bought in the London-market for a pound Sterling, would he inform himſelf any farther as to the intrinſic value of that money unit; would he not underſtand the value of it far better from that circumſtance than by the courſe of any exchange, ſince exchange does not mark the intrinſic value of money but only the value of that money tranſported from one place to another?

The price of bullion, therefore when it is not influenced by extraordinary demand, (ſuch as for the payment of a balance of trade, or for making an extraordinary proviſion of plate), but when it ſtands at what every body knows to be meant by the common market price, is a very tolerable meaſure of the value of the actual money-ſtandard in any country.

If it be therefore true, that a pound ſterling cannot purchaſe above 1638, grains of fine ſilver bullion, it will require not a little logic to prove that it is really, or has been for theſe many years, worth any more; notwithſtanding that the ſtandard weight of it in England is regulated by the laws of the kingdom at 1718.7 grains of fine ſilver.

If to this valuation of the pound Sterling drawn from the price of bullion, we add the other drawn from the courſe of exchange; and by this we find, that when paper is found for paper upon exchange, a pound Sterling cannot purchaſe above 1638 grains of fine ſilver in any country of Europe; upon theſe two authorities we may very ſafely conclude (as to the matter of fact at leaſt that the pound Sterling is not worth more, either in London or in any other trading city; and if this be the caſe, it is juſt worth 20 ſhillings of 65 to the pound troy.

If therefore the mint were to coin ſhillings at that rate, and pay for ſilver bullion at the market price, that is, at the rate of 65 pence per ounce in thoſe new coined ſhillings, they would be in proportion to the gold; ſilver would be carried to the mint equally with gold, and would be as little ſubject to be exported or melted down.

It may be inquired in this place, how far the coining the pound troy into 65 ſhillings is contrary to the laws of England?

The moment a ſtate pronounces a certain quantity of gold to be worth a certain quantity of ſilver, and orders theſe reſpective quantities of each metal to be received as equivalents of each other, and as lawful money in payments, that moment gold is made a ſtandard as much as ſilver. If therefore too ſmall a quantity of gold be ordered or permitted to be conſidered as an equivalent for the unit, the ſilver ſtandard is from that moment debaſed; or indeed more properly ſpeaking, all ſilver money is from that moment proſcribed; for who, from that time, will ever pay in ſilver, when he can pay cheaper in gold? Gold, therefore, by ſuch a law, is made the ſtandard, and all declarations to the contrary are againſt the matter of fact.

Were the king, therefore, to coin ſilver at 65 ſhillings in the pound, it is demonſtration, that by ſuch an act he would commit no adulteration upon the ſtandard: the adulteration is already committed. The ſtandard has deſcended to where it is by ſlow degrees, and by the operation of political cauſes only; and nothing prevents it from falling lower but the ſtandard of the gold coin. Let guineas be now left to ſeek their value as they did formerly, and let light ſilver continue to go by tale, we ſhall ſee the guineas up at 30 ſhillings in 20 years time, as was the caſe in 1695

It is as abſurd to ſay that the ſtandard of Queen Eliſabeth has not been debaſed by enacting that the Engliſh unit ſhall be acquitted with 113 grains of fine gold, as it would be to affirm that it would not be debaſed from what it is at preſent by enacting that a pound of butter ſhould every where be received in payment for a pound Sterling; although the pound Sterling ſhould continue to conſiſt of 3 ounces, 17 penny-weights, and 10 grains of ſtandard ſilver, according to the ſtatute of the 43 of Eliſabeth. In that caſe, moſt debtors would pay in butter; and ſilver would, as at preſent, acquire a conventional value as a metal, but would be looked upon no longer as a ſtandard, or as money.

If therefore by the law of England, a pound Sterling muſt conſiſt of 1718.7 grains troy of fine ſilver; by the law of England alſo, 113 grains of gold muſt be of the ſame value: but no law can eſtabliſh that proportion; conſequently; in which ever way a reformation be brought about, ſome law muſt be reverſed; conſequently, expediency, and not compliance with law, muſt be the motive in reforming the abuſe.

From what has been ſaid, it is not at all ſurpriſing that the pound Sterling ſhould in fact be reduced nearly to the value of the gold. Whether it ought to be kept at that value is another queſtion. All that we here decide is, that coining the pound troy into 65 ſhillings would reſtore the proportion of the metals, and render both ſpecies common in circulation. But reſtoring the weight and proportion of the coin is not the difficulty which prevents a reformation of the Engliſh coinage,

8. *Circumſtances to be attended to in a new Regulation of the Britiſh Coin.*

To people who do not underſtand the nature of ſuch operations it may have an air of juſtice to ſupport the unit at what is commonly believed to be the ſtandard of Queen Elizabeth, *viz.* at 1718 7 grains of fine ſilver.

The regulating the ſtandard of both ſilver and gold to $\frac{11}{12}$ fine, and the pound Sterling to four ounces ſtandard ſilver, as it ſtood during the reign of Queen Mary I. has alſo its advantages, as Mr Harris has obſerved. It makes the crown-piece to weigh juſt one ounce, the ſhilling four penny-weight, and the penny eight grains; conſequently, were the new ſtatute to bear, that the weight of the coin ſhould regulate its currency upon certain occaſions, the having the pieces adjuſted to certain aliquot parts of weight would make weighing eaſy, and would accuſtom the common people to judge of the value of money by its weight, and not by the ſtamp.

In that caſe there might be a conveniency in ſtriking the gold coins of the ſame weight with the ſilver; becauſe the proportion of their values would then conſtantly be the ſame with the proportion of the metals. The gold crowns would be worth at preſent 3 l. 12 s. 6d. the half crowns 1l. 16s. 3d. the gold ſhillings 14s. and 6d. and the half 7s. and 3d. This was anciently the practice in the Spaniſh mints.

The intereſts within the ſtate can be nowiſe perfectly protected but by permitting converſions of value from the old to the new ſtandard, whatever it be, and

Money. by regulating the footing of ſuch converſions by act of parliament, according to circumſtances.

For this purpoſe, we ſhall examine thoſe intereſts which will chiefly merit the attention of government, when they form a regulation for the future of acquitting permanent contracts already entered into. Such as may be contracted afterwards will naturally follow the new ſtandard.

The landed intereſt is no doubt the moſt conſiderable in the nation. Let us therefore examine, in the firſt place, what regulations it may be proper to make, in order to do juſtice to this great claſs, with reſpect to the land-tax on one hand, and with reſpect to their leſſees on the other.

The valuation of the lands of England was made many years ago, and reaſonably ought to be ſupported at the real value of the pound Sterling at that time, according to the principles already laid down. The general valuation, therefore, of the whole kingdom will riſe according to this ſcheme. This will be conſidered as an injuſtice; and no doubt it would be ſo, if, for the future, the land-tax be impoſed as heretofore, without attending to this circumſtance; but as that impoſition is annual, as it is laid on by the landed intereſt itſelf, who compoſe the parliament, it is to be ſuppoſed that this great claſs will at leaſt take care of their own intereſt.

Were the valuation of the lands to be ſtated according to the valuation of the pound Sterling of 1718.7 grains of ſilver, which is commonly ſuppoſed to be the ſtandard of Eliſabeth, there would be no great injury done: this would raiſe the valuation only 5 per cent. and the land-tax in proportion.

There is no claſs of inhabitants in all England ſo much at their eaſe, and ſo free from taxes, as the claſs of farmers. By living in the country, and by conſuming the fruits of the earth without their ſuffering any alienation, they avoid the effect of many exciſes, which, by thoſe who live in corporations, are felt upon many articles of their conſumption, as well as on thoſe which are immediately loaded with theſe impoſitions. For this reaſon it will not, perhaps, appear unreaſonable, if the additional 5 *per cent.* on the land-tax were thrown upon this claſs, and not upon the landlords.

With reſpect to leaſes, it may be obſerved, that we have gone upon the ſuppoſition that the pound Sterling in the year 1728 was worth 1718.7 grains of fine ſilver, and 113 grains of fine gold.

There would be no injuſtice done the leſſees of all the lands in the kingdom, were their rents to be fixed at the mean proportion of theſe values. We have obſerved how the pound Sterling has been gradually diminiſhing in its worth from that time by the gradual riſe of the ſilver. This mean proportion, therefore, will nearly anſwer to what the value of the pound Sterling was in 1743; ſuppoſing the riſe of the ſilver to have been uniform.

It may be farther alleged in favour of the landlords, that the gradual debaſement of the ſtandard has been more prejudicial to their intereſt in letting their lands, than to the farmers in diſpoſing of the fruits of them. Proprietors cannot ſo eaſily raiſe their rents upon new leaſes, as farmers can raiſe the prices of their grain according to the debaſement of the value of the currency.

The pound Sterling, thus regulated at the mean proportion of its worth, as it ſtands at preſent, and as it ſtood in 1728, may be realiſed in 1677.6 grains of fine ſilver, and 115.76 grains fine gold; which is 2.4 *per cent.* above the value of the preſent currency. No injury, therefore, would be done to leſſees, and no unreaſonable gain would accrue to the landed intereſt, in appointing converſions of all land-rents at 2½ *per cent.* above the value of the preſent currency.

Without a thorough knowledge of every circumſtance relating to Great Britain, it is impoſſible to lay down any plan. It is ſufficient here briefly to point out the principles upon which it muſt be regulated.

The next intereſt to be conſidered is that of the nation's creditors. The right regulation of their concerns will have a conſiderable influence in eſtabliſhing public credit upon a ſolid baſis, by making it appear to all the world, that no political operation upon the money of Great Britain can in any reſpect either benefit or prejudice the intereſt of thoſe who lend their money upon the faith of the nation. The regulating alſo the intereſt of ſo great a body, will ſerve as a rule for all creditors who are in the ſame circumſtances, and will upon other accounts be productive of greater advantages to the nation in time coming.

In 1749, a new regulation was made with the public creditors, when the intereſt of the whole redeemable national debt was reduced to 3 *per cent.* This circumſtance infinitely facilitates the matter with reſpect to this claſs, ſince, by this innovation of all former contracts, the whole national debt may be conſidered as contracted at, or poſterior to, the 25th of December 1749.

Were the ſtate, by any arbitrary operation upon money (which every reformation muſt be), to diminiſh the value of the pound Sterling in which the parliament at that time bound the nation to acquit thoſe capitals and the intereſt upon them, would not all Europe ſay, That the Britiſh parliament had defrauded their creditors? If therefore the operation propoſed to be performed ſhould have a contrary tendency, *viz.* to augment the value of the pound Sterling with which the parliament at that time bound the nation to acquit thoſe capitals and intereſts, muſt not all Europe alſo agree, That the Britiſh parliament had defrauded the nation?

This convention with the ancient creditors of the ſtate, who, in conſequence of the debaſement of the ſtandard, might have juſtly claimed an indemnification for the loſs upon their capitals, lent at a time when the pound Sterling was at the value of the heavy ſilver, removes all cauſes of complaint from that quarter. There was in the year 1749 an innovation in all their contracts; and they are now to be conſidered as creditors only from the 25th of December of that year.

Let the value of the pound Sterling be inquired into during one year preceding and one poſterior to the tranſactions of the month of December 1749. The great ſums borrowed and paid back by the nation during that period, will furniſh data ſufficient for that calculation. Let this value of the pound be ſpecified in troy grains of fine ſilver and fine gold bullion, without mentioning any denomination of money according to the exact proportion of the metals at that time. And let this pound be called *the pound of national credit.*

This firſt operation being determined, let it be enacted that the pound Sterling, by which the ſtate is to borrow for the future, and that in which the creditors are to be paid, ſhall be the exact mean proportion between the quantities of gold and ſilver above ſpecified, according to the actual proportion of the metals at the time ſuch payments ſhall be made: or that the ſums ſhall be borrowed or acquitted, one half in gold and one half in ſilver, at the reſpective requiſitions of the creditors or of the ſtate, when borrowing. All debts contracted poſterior to 1749 may be made liable to converſions.

The conſequence of this regulation will be the inſenſible eſtabliſhment of a bank-money. Nothing would be more difficult to eſtabliſh, by a poſitive revolution, than ſuch an invariable meaſure; and nothing will be found ſo eaſy as to let it eſtabliſh itſelf by its own advantages. This bank-money will be liable to much fewer inconveniences than that of Amſterdam. There the perſons tranſacting muſt be upon the ſpot; here, the Sterling currency may, every quarter of a year, be adjuſted by the exchequer to this invariable ſtandard, for the benefit of all debtors and creditors who incline to profit of the ſtability of this meaſure of value.

This ſcheme is liable to no inconvenience from the variation of the metals, let them be ever ſo frequent or hard to be determined; becauſe upon every occaſion where there is the ſmalleſt doubt as to the actual proportion, the option competent to creditors to be paid half in ſilver and half in gold will remove.

Such a regulation will alſo have this good effect, that it will give the nation more juſt ideas of the nature of money, and conſequently of the influence it ought to have upon prices.

If the value of the pound Sterling ſhall be found to have been by accident leſs in December 1749 than it is a preſent; or if at preſent the currency be found below what it has commonly been ſince 1749; in juſtice to the creditors, and to prevent all complaints, the nation may grant them the mean proportion of the value of the pound Sterling from 1749 to 1760, or any other which may to parliament appear reaſonable.

This regulation muſt appear equitable in the eyes of all Europe; and the ſtrongeſt proof of it will be, that it will not produce the ſmalleſt effect prejudicial to the intereſt of the foreign creditors. The courſe of exchange with regard to them will ſtand preciſely as before.

A Dutch, French, or German creditor, will receive the ſame value for his intereſt in the Engliſh ſtocks as heretofore. This muſt ſilence all clamours at home, being the moſt convincing proof, that the new regulation of the coin will have made no alteration upon the real value of any man's property, let him be debtor or creditor.

The intereſt of every other denomination of creditors, whoſe contracts are of a freſh date, may be regulated upon the ſame principles. But where debts are of an old ſtanding, juſtice demands, that attention be had to the value of money at the time of contracting. Nothing but the ſtability of the Engliſh coin, when compared with that of other nations, can make ſuch a propoſal appear extraordinary. Nothing is better known in France than this ſtipulation added to obligations, *argent au cours de ce jour*; that is to ſay, That the ſum ſhall be repaid in coin of the ſame intrinſic value with what has been lent. Why ſhould ſuch a clauſe be thought reaſonable for guarding people againſt arbitrary operations upon the numerary value of the coin, and not be found juſt upon every occaſion where the numerary value of it is found to be changed, let the cauſe be what it will?

The next intereſt we ſhall examine is that of trade. When men have attained the age of 21, they have no more occaſion for guardians. This may be applied to traders; they can parry with their pen every inconvenience which may reſult to other people from the changes upon money, provided only the laws permit them to do themſelves juſtice with reſpect to their engagements. This claſs demands no more than a right to convert all reciprocal obligations into denominations of coin of the ſame intrinſic value with thoſe they have contracted in.

The next intereſt is that of buyers and ſellers; that is, of manufacturers with regard to conſumers, and of ſervants with reſpect to thoſe who hire their perſonal ſervice.

The intereſt of this claſs requires a moſt particular attention. They muſt, literally ſpeaking, be put to ſchool, and taught the firſt principles of their trade, which is buying and ſelling. They muſt learn to judge of price by the grains of ſilver and gold they receive: they are children of a mercantile mother, however warlike the father's diſpoſition. If it be the intereſt of the ſtate that their bodies be rendered robuſt and active, it is no leſs the intereſt of the ſtate that their minds be inſtructed in the firſt principles of the trade they exerciſe.

For this purpoſe, tables of converſion from the old ſtandard to the new muſt be made, and ordered to be put up in every market, in every ſhop. All duties, all exciſes, muſt be converted in the ſame manner. Uniformity muſt be made to appear every where. The ſmalleſt deviation from this will be a ſtumbling-block to the multitude.

Not only the intereſt of the individuals of the claſs we are at preſent conſidering, demands the nation's care and attention in this particular; but the proſperity of trade, and the well-being of the nation, are alſo deeply intereſted in the execution.

The whole delicacy of the intricate combinations of commerce depends upon a juſt and equable vibration of prices, according as circumſtances demand it. The more, therefore, the induſtrious claſſes are inſtructed in the principles which influence prices, the more eaſily will the machine move. A workman then learns to ſink his price without regret, and can raiſe it without avidity. When principles are not underſtood, prices cannot gently fall, they muſt be pulled down; and merchants dare not ſuffer them to riſe, for fear of abuſe, even although the perfection of an infant manufacture ſhould require it.

The laſt intereſt is that of the bank of England, which naturally muſt regulate that of every other.

Had this great company followed the example of other banks, and eſtabliſhed a bank-money of an invariable ſtandard as the meaſure of all their debts and credits, they would not have been liable to any inconvenience upon a variation of the ſtandard.

The bank of England was projected about the year 1694, at a time when the current money of the nation was in the greateſt diſorder, and government in the greateſt diſtreſs both for money and for credit. Commerce was then at a very low ebb; and the only, or at leaſt the moſt profitable, trade of any, was jobbing in coin, and carrying backwards and forwards the precious metals from Holland to England. Merchants profited alſo greatly from the effects which the utter diſorder of the coin produced upon the price of merchandiſe.

At ſuch a juncture the reſolution was taken to make a new coinage; and upon the proſpect of this, a company was found, who, for an excluſive charter to hold a bank for 13 years, willingly lent the government upwards of a million Sterling at 8 *per cent.* (in light money we ſuppoſe), with a proſpect of being repaid both intereſt and capital in heavy. This was not all: part of the money lent was to be applied for the eſtabliſhment of the bank; and no leſs than 4000l. a-year was allowed to the company, above the full intereſt, for defraying the charge of the management.

Under ſuch circumſtances the introduction of bank-money was very ſuperfluous, and would have been very impolitic. That invention is calculated againſt the raiſing of the ſtandard: but here the bank profited of that riſe in its quality of creditor for money lent; and took care not to commence debtor by circulating their paper until the effect of the new regulation took place in 1695; that is, after the general re-coinage of all the clipped ſilver.

From that time till now, the bank of England has been the baſis of the nation's credit, and with great reaſon has been conſtantly under the moſt intimate protection of every miniſter.

The value of the pound Sterling, as we have ſeen, has been declining ever ſince the year 1601, the ſtandard being fixed to ſilver during all that century, while the gold was conſtantly riſing. No ſooner had the proportion taken another turn, and ſilver begun to riſe, than the government of England threw the ſtandard virtually upon the gold, by regulating the value of the guineas at the exact proportion of the market. By theſe operations, however, the bank has conſtantly been a gainer (in its quality of debtor) upon all the paper in circulation; and therefore has loſt nothing by not having eſtabliſhed a bank-money.

The intereſt of this great company being eſtabliſhed upon the principles we have endeavoured to explain, it is very evident, that the government of England never will take any ſtep in the reformation of the coin which in its conſequences can prove hurtful to the bank. Such a ſtep would be contrary both to juſtice and to common ſenſe. To make a regulation which, by raiſing the ſtandard, will prove beneficial to the public creditors, to the prejudice of the bank (which we may call the *public debtor*), would be an operation upon public credit like that of a perſon who is at great pains to ſupport his houſe by props upon all ſides, and who at the ſame time blows up the foundation of it with gunpowder.

We may therefore conclude, that with regard to the bank of England, as well as every other private banker, the notes which are conſtantly payable upon demand muſt be made liable to a conversion at the actual value of the pound Sterling at the time of the new regulation.

That the bank will gain by this, is very certain; but the circulation of their notes is ſo ſwift, that it would be abſurd to allow to the then poſſeſſors of them that indemnification which naturally ſhould be ſhared by all theſe through whoſe hands they have paſſed, in proportion to the debaſement of the ſtandard during the time of their reſpective poſſeſſion.

Beſides theſe conſiderations, which are in common to all ſtates, the government of Great Britain has one peculiar to itſelf. The intereſt of the bank, and that of the creditors, are diametrically oppoſite: every thing which raiſes the ſtandard hurts the bank; every thing which can ſink it hurts the creditors: and upon the right management of the one and the other, depends the ſolidity of public credit. For theſe reaſons, without the moſt certain proſpect of conducting a reſtitution of the ſtandard to the general advantage as well as approbation of the nation, no miniſter will probably ever undertake ſo dangerous an operation.

We ſhall now propoſe an expedient which may remove at leaſt ſome of the inconveniences which would reſult from ſo extenſive an undertaking as that of regulating the reſpective intereſts in Great Britain by a poſitive law, upon a change in the value of their money of account.

Suppoſe then, that, before any change is made in the coin, government ſhould enter into a tranſaction with the public creditors, and aſcertain a permanent value for the pound ſterling for the future, ſpecified in a determined proportion of the fine metals in common bullion, without any regard to money of account, or to any coin whatever.

This preliminary ſtep being taken, let the intended alteration of the ſtandard be proclaimed a certain time before it is to commence. Let the nature of the change be clearly explained, and let all ſuch as are engaged in contracts which are diſſolvable at will upon the preſtations ſtipulated, be acquitted between the parties, or innovated as they ſhall think proper; with certification, that, poſterior to a certain day, the ſtipulations formerly entered into ſhall be binding according to the denominations of the money of account in the new ſtandard.

As to permanent contracts, which cannot at once be fulfilled and diſſolved, ſuch as leaſes, the parliament may either preſcribe the methods and terms of converſion; or a liberty may be given to the parties to annul the contract, upon the debtor's refuſing to perform his agreement according to the new ſtandard. Contracts, on the other hand, might remain ſtable, with reſpect to creditors who would be ſatisfied with payments made on the footing of the old ſtandard. If the riſe intended ſhould not be very conſiderable, no great injuſtice can follow ſuch a regulation.

Annuities are now thoroughly underſtood, and the value of them is brought to ſo nice a calculation, that nothing will be eaſier than to regulate theſe upon the footing of the value paid for them, or of the ſubject effected by them. If by the regulation, land rents are made to riſe in denomination, the annuities charged upon them ought to riſe in proportion; if in intrinſic value, the annuity ſhould remain as it was.

7. *Regulations which the Principles of this Inquiry point out as expedient to be made by a new Statute for regulating the Britiſh Coin.*

Let us now examine what regulations it may be proper to make by a new ſtatute concerning the coin of Great Britain, in order to preſerve always the ſame exact value of the pound Sterling realized in gold and in ſilver, in ſpite of all the incapacities inherent in the metals to perform the functions of an invariable ſcale or meaſure of value.

1. The firſt point is to determine the exact number of grains of fine gold and fine ſilver which are to compoſe it, according to the then proportion of the metals in the London market.

2. To determine the proportion of theſe metals with the pound troy: and in regard that the ſtandard of gold and ſilver is different, let the mint price of both metals be regulated according to the pound troy fine.

3. To fix the mint-price within certain limits; that is to ſay, to leave to the king and council, by proclamation, to carry the mint price of bullion up to the value of the coin, as is the preſent regulation, or to ſink it to *per cent.* below that price, according as government ſhall incline to impoſe a duty upon coinage.

4. To order, that ſilver and gold coin ſhall be ſtruck of ſuch denominations as the king ſhall think fit to appoint; in which the proportion of the metals above determined ſhall be conſtantly obſerved through every denomination of the coin, until neceſſity ſhall make a new general coinage unavoidable.

5. To have the number of grains of the fine metal in every piece marked upon the exergue, or upon the legend of the coin, in place of ſome initial letters of titles, which not one perſon in a thouſand can decypher; and to make the coin of as compact a form as poſſible, diminiſhing the ſurface of it as much as is conſiſtent with beauty.

6. That it ſhall be lawful for all contracting parties to ſtipulate their payments either in gold or ſilver coin, or to leave the option of the ſpecies to one of the parties.

7. That where no particular ſtipulation is made, creditors ſhall have power to demand payment, half in one ſpecies, half in the other; and when the ſum cannot fall equally into gold and ſilver coins, the fractions to be paid in ſilver.

8. That in buying and ſelling, when no particular ſpecies has been ſtipulated, and when no act in writing has intervened, the option of the ſpecies ſhall be competent to the buyer.

9. That all ſums paid or received by the king's receivers, or by bankers, ſhall be delivered by weight, if demanded.

10. That all money which ſhall be found under the legal weight, from whatever cauſe it may proceed, may be refuſed in every payment whatſoever; or if offered in payment of a debt above a certain ſum, may be taken according to its weight, at the then mint price, in the option of the creditor.

11. That no penalty ſhall be incurred by thoſe who melt down or export the nation's coin; but that waſhing, clipping, or diminiſhing the weight of any part of it ſhall be deemed felony, as much as any other theft, if the perſon ſo degrading the coin ſhall afterwards make it circulate for lawful money.

To prevent the inconveniences proceeding from the variation in the proportion between the metals, it may be provided,

12. That upon every variation of proportion in the market-price of the metals, the price of both ſhall be changed, according to the following rule:

Let the price of the pound troy fine gold in the coin be called *G*.

Let the price of ditto in the ſilver be called *S*.

Let the new proportion between the market-price of the metals be called *P*.

Then ſtate this formula:

$$\frac{G}{2P}+\frac{S}{2}= \text{to a pound troy fine ſilver, in Sterling currency.}$$

$$\frac{S}{2}+P+\frac{G}{2}= \text{to a pound troy fine gold, in Ster. currency.}$$

This will be a rule for the mint to keep the price of the metals conſtantly at par with the price of the market; and coinage may be impoſed, as has been deſcribed, by fixing the mint price of them at a certain rate below the value of the fine metals in the coin.

14. As long as the variation of the market-price of the metals ſhall not carry the price of the riſing metal ſo high as the advanced price of the coin above the bullion, no alteration need be made on the denomination of either ſpecies.

14. So ſoon as the variation of the market price of the metals ſhall give a value to the riſing ſpecies, above the difference between the coin and the bullion; then the king ſhall alter the denominations of all the coin, ſilver and gold, adding to the coins of the riſing metal exactly what is taken from thoſe of the other. An example will make this plain:

Let us ſuppoſe that the coinage has been made according to the proportion of 14.5 to 1; that 20 ſhillings, or 4 crown-pieces, ſhall contain, in fine ſilver, 14.5 times as many grains as the guinea, or the gold pound, ſhall contain grains of fine gold. Let the new proportion of the metals be ſuppoſed to be 14 to 1. In that caſe, the 20 ſhillings, or the 4 crowns, will contain $\frac{1}{26}$ more value than the guinea. Now ſince there is no queſtion of making a new general coinage upon every variation, in order to adjuſt the proportion of the metals in the weight of the coins, that proportion might be adjuſted by changing their reſpective denominations according to this formula:

Let the 20 ſhillings, or 4 crowns, in coin, be called *S*. Let the guinea be called *G*. Let the difference between the old proportion and the new, which is $\frac{1}{29}$, be called *P*. Then ſay,

$$S-\frac{P}{2}= \text{a pound ſterling, and } G+\frac{P}{2}= \text{a pound ſterl.}$$

By this it appears that all the ſilver coin muſt be

Money.

[illegible] nomination [illegible], and all the gold coin [illegible] in its denomination [illegible]; yet ſtill [illegible] will [illegible] two pounds Sterling, as before, whether [illegible] conſidered according to the old or according to the new denominations.

But it [illegible] obſerved, that the impoſition of coinage render[illegible] the value of the coin greater than the value of the bullion, that circumſtance gives a certain latitude in fixing the new denominations of the coin, ſo as to avoid minute fractions. For, providing the deviation from the exact proportion ſhall fall within the advanced price of the coin, no advantage can be taken by melting down one ſpecies preferably to another; ſince, in either caſe, the loſs incurred by melting the coin muſt be greater than the profit made upon ſelling the bullion. The mint price of the metals, however, may be fixed exactly, that is, within the value of a farthing upon a pound of fine ſilver or gold. This is eaſily reckoned at the mint; although upon every piece in common circulation the fractions of farthings would be inconvenient.

15. That notwithſtanding of the temporary variations made upon the denomination of the gold and ſilver coins, all contracts formerly entered into, and all ſtipulations in pounds ſhillings and pence, may continue to be acquitted according to the old denominations of the coins, paying one-half in gold and one-half in ſilver: unleſs in the caſe where a particular ſpecies has been ſtipulated; in which caſe, the ſums muſt be paid according to the new regulation made upon the denomination of that ſpecies, to the end that neither profit nor loſs may reſult to any of the parties.

16. That notwithſtanding the alterations on the mint price of the metals, and in the denomination of the coins, no change ſhall be made upon the weight of the particular pieces of the latter, except in the caſe of a general re-coinage of one denomination at leaſt: that is to ſay, the mint muſt not coin new guineas, crowns, &c. of a different weight from thoſe already in currency, although by ſo doing the fractions might be avoided. This would occaſion confuſion, and the remedy would ceaſe to be of any uſe upon a new change in the proportion of the metals. But it may be found convenient, for removing the ſmall fractions in ſhillings and ſixpences, to recoin ſuch denominations altogether, and to put them to their integer numbers, of twelve and of ſix pence, without changing in any reſpect their proportion of value to all other denominations of the coin: this will be no great expence, when the bulk of the ſilver coin is put into 5 ſhilling pieces.

By this method of changing the denominations of the coin, there never can reſult any alteration in the value of the pound Sterling; and although fractions of value may now and then be introduced, in order to prevent the abuſes to which the coin would otherwiſe be expoſed by the artifice of thoſe who melt it down, yet ſtill the inconvenience of theſe fractions may be avoided in paying, according to the old denominations, in both ſpecies, by equal parts. This will alſo prove demonſtratively, that no change is thereby made in the true value of the national unit of money.

17. That it be ordered, that ſhillings and ſixpences ſhall only be current for 20 years; and all other coins, both gold and ſilver, for 40 years, or more. For aſcertaining which term, there may be marked, upon the exergue of the coin, the laſt year of their currency, in place of the date of their fabrication. This term elapſed, or the date effaced, that they ſhall have no more currency whatſoever; and, when offered in payment, may be received as bullion at the actual price of the mint, or refuſed, at the option of the creditor.

18. That no foreign coin ſhall have any *legal* currency, except as bullion at the mint price.

By theſe and the like regulations may be prevented, *1mo,* The melting or exporting of the coin in general. *2do,* The melting or exporting one ſpecies, in order to ſell it as bullion at the advanced price. *3tio,* The profit in acquitting obligations preferably in one ſpecies to another. *4to,* The degradation of the ſtandard, by the wearing of the coin, or by a change in the proportion between the metals. *5to,* The circulation of the coin below the legal weight. *6to,* The profit that other nations reap by paying their debts more cheaply to Great Britain than Great Britain can pay her's to them.

And the great advantage of it is, that it is an uniform plan, and may ſerve as a perpetual regulation, compatible with all kinds of denominations of coins, variations in the proportion of the metals, and with the impoſition of a duty upon coinage, or with the preſerving it free; and further, that it may in time be adopted by other nations, who will find the advantage of having their money of account preſerved perpetually at the ſame value, with reſpect to the denominations of all foreign money of account eſtabliſhed on the ſame principles.

A TABLE

A TABLE OF COINS.

Showing the Quantity of Fine Metal contained in them.

The number of grains of fine metal in every coin is ſought for in the regulations of the mint of the country where it is coined, and is expreſſed in the grains in uſe in that mint. From that weight it is converted into thoſe of other countries according to the following proportions:

5840 Troy grains, 4676.35 Paris grains, 5192.8 Holland aces or grains, and 4649.06 Colonia grains, are ſuppoſed to be equal weights; and the coins in the Table are converted according to thoſe proportions.

Table of Coins, reduced to Grains of fine Metal, according to the Troy, Paris, Colonia, and Holland weights.		Gold Coins.				Silver Coins.			
		Troy.	Paris.	Colonia.	Holland.	Troy.	Paris.	Colonia.	Holland.
English Coins.	1 A Guinea by ſtatute	118.651	144.46	143.65	160.45				
	2 A Crown by ſtatute	— —	— —	— —	— —	429.68	523.2	520.2	581.
	3 A ſhilling by ſtatute	— —	— —	— —	— —	85.935	104.65	104.	116.2
	4 A ſilver Pound Sterling by ſtatute 1601	— —	— —	— —	— —	1718.7	2093.	2080.8	2324.1
	5 A Gold Pound Sterling by ſtatute 1728	113.	137.61	136.8	152.8				
	6 A ſilver Pound Sterling in currency = $\frac{20}{62}$ lb. Troy	— —	— —	— —	— —	1639.38	1996.4	1984.7	2216.
	7 A Silver Pound Sterl. at the proportion of gold to ſilver as 1 to $14\frac{1}{2}$	113.	137.61	136.8	152.8	1638.5	1995.3	1983.7	2215.7
	8 A Gold Pound Sterling at the ſame proportion of 1 to $14\frac{1}{2}$	118.4	144.18	143.34	160.11	1718.7	2093.	2080.8	2324.1
	9 A Pound Sterling at the mean proportion in gold and in ſilver	115.769	140.98	140.16	156.55	1678.6	2044.2	2032.2	2269.9
	10 A Shilling current = $\frac{1}{62}$ of a pound Troy	— —	— —	— —	— —	81.961	99.8	99.	110.82
	11 A Guinea in Silver, or 21 Shillings ſtandard weight	— —	— —	— —	— —	1804.6	2197.6	2184.8	2440.3
	12 A Guinea at the proportion of 1 to $14\frac{1}{2}$, worth in Silver	— —	— —	— —	— —	1720.4	2095.1	2082.8	2326.4
	13 A Pound Troy, or 12 ounces Engliſh weight	5760.	7019.2	6973.5	7789.2				
French Coins.	1 A Louis d'or	113.27	137.94	137.13	153.17				
	2 A Crown of ſix livres	— —	— —	— —	— —	409.94	499.22	496.3	554.3
	3 A Crown of three ditto	— —	— —	— —	— —	204.97	249.61	248.15	277.1
	4 A livre	— —	— —	— —	— —	68.34	83.23	82.74	92.42
	5 A Louis d'or, or 24 livres in ſilver	— —	— —	— —	— —	1639.7	1996.9	1985.2	2217.4
	6 A Marc of Paris weight, fine gold or ſilver	3783.87	4608.	4581.1	5116.9	3783.87	4608.	4581.1	5116.9
	7 A Marc of gold coin effective weight, in fine	3398.3	4138.5	4114.3	4593.4				
	8 A Mark of ſilver coin effective weight, in fine	— —	— —	— —	— —	3402.3	4143.4	4119.2	4600.9
German Coins.	1 A Carolin legal weight	115.45	140.6	139.78	156.12				
	2 A Ducat of the Empire ditto	52.8	64.37	64.	71.48				
	3 A Florin of Convention	— —	— —	— —	— —	179.73	218.87	217.6	243.
	4 A Dollar of Convention	— —	— —	— —	— —	269.59	328.31	326.4	364.5
	5 A Dollar of Exchange, the Carolin = 9 flor. 42 kreutzers	17.85	21.74	21.615	24.14				
	6 a Florin current = $\frac{1}{11}$ of a Carolin	10.54	12.84	12.77	14.26				
	7 A Carolin in ſilver, at the proportion of 1 to $14\frac{1}{2}$	— —	— —	— —	— —	1674.	2038.6	2026.8	2263.8
Dutch Coins.	1 A Dutch Ducat	51.76	6.3	62.67	70.				
	2 A Florin in Silver	— —	— —	— —	— —	148.	180.3	179.2	200.21

UNIVERSAL TABLE

Of the preſent State of the REAL and IMAGINARY MONIES of the World.

† This mark is prefixed to the Imaginary Money, or Money of Account.

All Fractions in the Value Engliſh are Parts of a PENNY.

= This mark ſignifies *is*, *make*, or *equal to*.

EUROPE, Northern Parts.

ENGLAND AND SCOTLAND.

London, Briſtol, Liverpool, &c.
Edinburgh, Glaſgow, Aberdeen, &c.

			£.	s.	d.
A Farthing		- - -	0	0	0$\frac{1}{4}$
2 Farthings	=	a Halfpenny -	0	0	0$\frac{1}{2}$
2 Halfpence		a Penny -	0	0	1
4 Pence		a Groat -	0	0	4
6 Pence		a Half Shilling	0	0	6
12 Pence		a Shilling -	0	1	0
5 Shillings		a Crown -	0	5	0
20 Shillings		†a Pound Sterling	1	0	0
21 Shillings		a Guinea -	1	1	0

IRELAND.

Dublin, Cork, Londonderry, &c.

			£.	s.	d.
A farthing		- -	0	0	0$\frac{3}{13}$
2 Farthings	=	a Halfpenny -	0	0	0$\frac{6}{13}$
2 Halfpence		†a Penny -	0	0	0$\frac{12}{13}$
6$\frac{1}{2}$ Pence		a Half Shilling -	0	0	6
12 Pence		†a Shilling Iriſh -	0	0	11$\frac{1}{13}$
13 Pence		a ſhilling -	0	1	0
65 Pence		a Crown -	0	5	0
20 Shillings		†a Pound Iriſh	0	18	5$\frac{1}{2}$
22$\frac{3}{4}$ Shillings		a Guinea -	1	1	0

FLANDERS AND BRABANT.

Ghent, Oſtend, &c. Antwerp, Bruſſels, &c.

			£.	s.	d.
†A Pening		- - -	0	0	0$\frac{9}{160}$
4 Peningens	=	an Urch - -	0	0	0$\frac{9}{40}$
8 Peningens		†a Grote -	0	0	0$\frac{9}{20}$
2 Grotes		a Petard -	0	0	0$\frac{9}{10}$
6 Petards		†a Scalin -	0	0	5$\frac{2}{5}$
7 Petards		a Scalin -	0	0	6$\frac{3}{10}$
40 Grotes		†a Florin -	0	1	6
17$\frac{1}{2}$ Scalins		a Ducat -	0	9	3
240 Grotes		†a Pound Flem. -	0	9	0

HOLLAND AND ZEALAND.

Amſterdam, Rotterdam, Middleburg, Fluſhing, &c.

			£.	s.	d.
† Pening		- - -	0	0	0$\frac{21}{320}$
8 Peningens	=	†a Grote - -	0	0	0$\frac{21}{40}$
2 Grotes		a Stiver -	0	0	1$\frac{1}{20}$
6 Stivers		a Scalin -	0	0	6$\frac{3}{10}$
20 Stivers		a Guilder -	0	1	9
50 Stivers		a Rix-dollar -	0	4	4$\frac{1}{2}$

HOLLAND, &c.

		£.	s.	d.
60 Stivers	a Dry Guilder -	0	5	3
105 Stivers	a Ducat - -	0	9	3
6 Guilders	†a Pound Flem. -	0	10	6

EUROPE, Northern Parts.

GERMANY.

HAMBURG. *Altena, Lubec, Bremen, &c.*

			£.	s.	d.
†A Trylling	=	- - -	0	0	0$\frac{3}{128}$
2 Trylings		†a Sexling -	0	0	0$\frac{3}{64}$
2 Sexlings		a Fening -	0	0	0$\frac{3}{32}$
12 Fenings		a Shilling Lub.	0	0	1$\frac{1}{8}$
16 Shillings		†a Marc -	0	1	6
2 Marcs		a Slet dollar -	0	3	0
3 Marcs		a Rix-dollar -	0	4	6
6$\frac{1}{4}$ Marcs		a Ducat -	0	9	4$\frac{1}{2}$
120 Shillings		†a Pound Flem.	0	11	3

HANOVER. *Lunenburgh, Zell, &c.*

			£.	s.	d.
†A Fening	=	- -	0	0	0$\frac{7}{48}$
3 Fenings		a Dreyer -	0	0	0$\frac{7}{16}$
8 Fenings		a Marien - -	0	0	1$\frac{1}{6}$
12 Fenings		a Groſh -	0	0	1$\frac{3}{4}$
8 Groſhen		a Half Gulden -	0	1	2
16 Groſhen		a Gulden -	0	2	4
24 Groſhen		†a Rix-dollar -	0	3	6
32 Groſhen		a Double Gulden	0	4	8
4 Guldens		a Ducat -	0	9	2

SAXONY AND HOLSTEIN.

Dreſden, Leipſic, &c. Wiſmar, Keil, &c.

			£.	s.	d.
†An Heller	=	- -	0	0	0$\frac{7}{96}$
2 Hellers		a Fening -	0	0	0$\frac{7}{48}$
6 Hellers		a Dreyer -	0	0	0$\frac{7}{16}$
16 Hellers		a Marien - -	0	0	1$\frac{1}{6}$
12 Fenings		a Groſh -	0	0	1$\frac{3}{4}$
16 Groſhen		a Gould - -	0	2	4
24 Groſhen		†a Rix-dollar -	0	3	6
32 Groſhen		a Specie-dollar .	0	4	8
4 Goulds		a Ducat . .	0	9	4

BRANDENBURGH AND POMERANIA.

Berlin, Potſdam, &c. Stetin, &c.

			£.	s.	d.
†A Denier	=	. .	0	0	0$\frac{7}{270}$
9 Deniers		a Polchen .	0	0	0$\frac{7}{30}$
18 Deniers		a Groſh . .	0	0	0$\frac{7}{15}$
3 Polchens		an Abraſs .	0	0	0$\frac{7}{10}$
20 Groſhen		†a Marc .	0	0	9$\frac{1}{3}$

EUROPE, Northern Parts. GERMANY.

BRANDENBURGH, &c.

			£.	s.	d.
30 Groſhen		a Florin	0	1	2
90 Groſhen		†a Rix-dollar	0	3	6
108 Groſhen		an Albertus	0	4	2
8 Florins		a Ducat	0	9	4

COLOGN, *Mentz, Triers, Liege,* [illegible]*, Munſter, Paderbourn, &c.*

A Dute			0	0	0 $\frac{7}{80}$
3 Dutes	=	a Cruitzer	0	0	0 $\frac{21}{80}$
2 Cruitzers		an Albus	0	0	0 $\frac{21}{40}$
8 Dutes		a Stiver	0	0	0 $\frac{7}{10}$
3 Stivers		a Plapert	0	0	2 $\frac{1}{10}$
4 Plaperts		a Copſtuck	0	0	8 $\frac{2}{5}$
40 Stivers		a Guilder	0	2	4
2 Guilders		a Hard Dollar	0	4	8
4 Guilders		a Ducat	0	9	4

BOHEMIA, SILESIA, AND HUNGARY.

Prague, Breſlaw, Preſburg, &c.

A Fening			0	0	0 $\frac{7}{60}$
2 Fenings	=	a Dreyer	0	0	0 $\frac{7}{30}$
3 Fenings		a Groſh	0	0	0 $\frac{7}{20}$
4 Fenings		a Cruitzer	0	0	0 $\frac{7}{15}$
2 Cruitzers		a White Groſh	0	0	0 $\frac{14}{15}$
60 Cruitzers		a Gould	0	2	4
90 Cruitzers		†a Rix-dollar	0	3	6
2 Goulds		a Hard dollar	0	4	8
4 Goulds		a Ducat	0	9	4

AUSTRIA AND SWABIA.

Vienna, Tieſt, &c. Auſburg, Blenheim, &c.

A Fening			0	0	0 $\frac{7}{60}$
2 Fenings	=	a Dreyer	0	0	0 $\frac{7}{30}$
4 Fenings		a Cruitzer	0	0	0 $\frac{7}{15}$
14 Fenings		a Groſh	0	0	1 $\frac{19}{30}$
4 Cruitzers		a Batzen	0	0	1 $\frac{13}{15}$
15 Batzen		a Gould	0	2	4
90 Cruitzers		†a Rix-dollar	0	3	6
30 Batzen		a Specie-dollar	0	4	8
60 Batzen		a Ducat	0	9	4

FRANCONIA, *Francfort, Nuremburg, Dettingen, &c.*

A Fening			0	0	0 $\frac{7}{60}$
4 Fenings	=	a Cruitzer	0	0	0 $\frac{7}{15}$
3 Cruitzers		a Keyſer Groſh	0	0	1 $\frac{2}{5}$
4 Cruitzers		a Batzen	0	0	1 $\frac{13}{15}$
15 Cruitzers		an Ort Gould	0	0	7
60 Cruitzers		a Gould	0	2	4
90 Cruitzers		†a Rix-dollar	0	3	6
2 Goulds		a Hard Dollar	0	4	8
240 Cruitzers		a Ducat	0	9	4

POLAND AND PRUSSIA.

Cracow, Warſaw, &c. Dantzic, Koningſberg, &c.

A Schelon			0	0	0 $\frac{7}{45}$
3 Schelons	=	a Groſh	0	0	0 $\frac{7}{15}$
5 Groſhens		a Couſtic	0	0	2 $\frac{1}{3}$
3 Couſtics		a Tinſe	0	0	7

EUROPE, Northern Parts.

POLAND, &c.

			£.	s.	d.
18 Groſhen	=	an Ort	0	0	8 $\frac{2}{5}$
30 Groſhen		a Florin	0	1	2
90 Groſhen		†a Rix-dollar	0	3	6
8 Florins		a Ducat	0	9	4
5 Rix-dollars		a Frederic d'Or	0	17	6

LIVONIA.

Riga, Revel, Narva, &c.

A Blacken			0	0	0 $\frac{7}{90}$
6 Blackens	=	a Groſh	0	0	0 $\frac{7}{15}$
9 Blackens		a Vording	0	0	0 $\frac{7}{10}$
2 Groſhen		a Whiten	0	0	0 $\frac{14}{15}$
6 Groſhen		a Marc	0	0	2 $\frac{4}{5}$
30 Groſhen		a Florin	0	1	2
90 Groſhen		†a Rix-dollar	0	3	6
108 Groſhen		an Albertus	0	4	2 $\frac{2}{5}$
64 Whitens		a Copper-plate Dollar	0	5	0

DENMARK, ZEALAND, AND NORWAY.

Copenhagen, Sound, &c. Bergen, Dronthiem, &c.

A Skilling			0	0	0 $\frac{9}{16}$
6 Skillings	=	a Duggen	0	0	3 $\frac{3}{8}$
16 Skillings		†a Marc	0	0	9
20 Skillings		a Rix-marc	0	0	11 $\frac{1}{4}$
24 Skillings		a Rix ort	0	1	1 $\frac{1}{2}$
4 Marcs		a Crown	0	3	0
6 Marcs		a Rix dollar	0	4	6
11 Marcs		a Ducat	0	8	3
14 Marcs		a Hatt Ducat	0	10	6

SWEDEN AND LAPLAND.

Stockholm, Upſal, &c. Thorn, &c.

† A Runſtick			0	0	0 $\frac{7}{36}$
2 Runſticks	=	a Stiver	0	0	0 $\frac{7}{18}$
8 Runſticks		a Copper Marc	0	0	1 $\frac{5}{9}$
3 Copper Marcs		a Silver Marc	0	0	4 $\frac{2}{3}$
4 Copper Marcs		a Copper Dollar	0	0	6 $\frac{2}{9}$
9 Copper Marcs		a Caroline	0	1	2
3 Copper Dollars		a Silver Dollar	0	1	6 $\frac{2}{3}$
3 Silver Dollars		a Rix dollar	0	4	8
2 Rix dollars		a Ducat	0	9	4

RUSSIA AND MUSCOVY.

Peterſburg, Archangel, &c. Moſcow, &c.

A Poluſca			0	0	0 $\frac{27}{200}$
2 Poluſcas	=	a Denuſca	0	0	0 $\frac{27}{100}$
2 Denuſcas		†a Copec	0	0	0 $\frac{27}{50}$
3 Copecs		an Altin	0	0	1 $\frac{31}{50}$
10 Copecs		a Grievener	0	0	5 $\frac{2}{5}$
25 Copecs		a Polpotin	0	1	1 $\frac{1}{2}$
50 Copecs		a Poltin	0	2	3
100 Copecs		a Ruble	0	4	6
2 Rubles		a Xervonitz	0	9	0

BASIL. *Zurich, Zug,* &c.

A Rap			0	0	0 $\frac{1}{28}$
3 Rapen	=	a Fening	0	0	0 $\frac{3}{28}$
4 Fenings		a Cruitzer	0	0	0 $\frac{3}{7}$
12 Fenings		†a Sol	0	0	1 $\frac{2}{7}$

EUROPE, Southern Parts.

SWITZERLAND.

BASIL, &c.

			£.	s.	d.
15 Fenings	=	a Coarſe Batzen	0	0	1 7/8
18 Fenings		a Good Batzen	0	0	2 1/4
20 Sols		†a Livre	0	2	6
60 Cruitzers		a Gulden	0	2	6
108 Cruitzers		a Rix dollar	0	4	6

St GALL. *Apenſal, &c.*

			£.	s.	d.
An Heller			0	0	0 1/16
2 Hellers	=	a Fening	0	0	0 1/8
4 Fenings		a Cruitzer	0	0	0 1/2
12 Fenings		†a Sol	0	0	1 1/2
4 Cruitzers		a Coarſe Batzen	0	0	2
5 Cruitzers		a Good Batzen	0	0	2 1/2
20 Sols		†a Livre	0	2	6
60 Cruitzers		a Gould	0	2	6
102 Cruitzers		a Rix-dollar	0	4	3

BERN. *Lucern, Neufchatel, &c.*

			£.	s.	d.
A Denier			0	0	0 1/10
4 Deniers	=	a Cruitzer	0	0	0 2/5
3 Cruitzers		†a Sol	0	0	1 1/5
4 Cruitzers		a Plapert	0	0	1 3/5
5 Cruitzers		a Gros	0	0	2
6 Cruitzers		a Batzen	0	0	2 2/5
20 Sols		†a Livre	0	2	0
75 Cruitzers		a Gulden	0	2	6
135 Cruitzers		a Crown	0	4	6

GENEVA. *Pekay, Bonne, &c.*

			£.	s.	d.
A Denier			0	0	0 1/32
2 Deniers	=	a Denier current	0	0	0 1/16
12 Deniers		a Small Sol	0	0	0 3/8
12 Deniers current		a Sol current	0	0	0 3/4
12 Small Sols		†a Florin	0	0	4 1/2
20 Sols current		†a Livre current	0	1	3
10 1/2 Florins		a Patacon	0	3	11 1/4
15 3/4 Florins		a Croiſade	0	5	10 7/8
24 Florins		a Ducat	0	9	0

FRANCE and NAVARRE.

Liſle, Cambray, Valenciennes, &c.

			£.	s.	d.
A Denier			0	0	0 1/24
12 Deniers	=	a Sol	0	0	0 1/2
15 Deniers		†a Patard	0	0	0 5/8
15 Patards		†a Piette	0	0	9 3/4
20 Sols		a Livre Tournois	0	0	10
20 Patards		†a Florin	0	1	0 1/2
60 Sols		an Ecu of Ex.	0	2	6
10 1/2 Livres		a Ducat	0	9	3
24 Livres		a Louis d'Or	1	0	0

Dunkirk, St Omers, St Quintin, &c.

			£.	s.	d.
A Denier			0	0	0 1/24
12 Deniers	=	a Sol	0	0	0 1/2
15 Deniers		†a Patard	0	0	0 5/8
15 Sols		†a Piette	0	0	7 1/2
20 Sols		†a Livre Tournois	0	0	10
3 Livres		an Ecu of Ex.	0	2	6
24 Livres		a Louis d'Or	1	0	0
25 1/2 Livres		a Guinea	1	1	0
32 2/5 Livres		a Moeda	1	7	0

Paris, Lyons, Marſeilles, &c. Bourdeaux, Bayonne, &c.

			£.	s.	d.
A Denier			0	0	0 1/24
3 Deniers	=	a Liard	0	0	0 1/8
2 Liards		a Dardene	0	0	0 1/4
12 Deniers		a Sol	0	0	0 1/2
20 Sols		†a Livre Tournois	0	0	10
60 Sols		an Ecu of Ex.	0	2	6
6 Livres		an Ecu	0	5	0
10 Livres		†a Piſtole	0	8	4
24 Livres		a Louis d'Or	1	0	0

PORTUGAL. *Liſbon, Oporto, &c.*

			£.	s.	d.
† A Re			0	0	0 27/400
10 Rez	=	a Half Vintin	0	0	0 27/40
20 Rez		a Vintin	0	0	1 7/20
5 Vintins		a Teſtoon	0	0	6 3/4
4 Teſtoons		a Cruſade of Ex.	0	2	3
24 Vintins		a New Cruſade	0	2	8 2/5
10 Teſtoons		†a Milre	0	5	7 1/2
48 Teſtoons		a Moeda	1	7	0
64 Teſtoons		a Joaneſe	1	16	0

SPAIN and CATALONIA.

Madrid, Cadiz, Seville, &c. New Plate.

			£.	s.	d.
A Maravedie			0	0	0 43/272
2 Maravedies	=	a Quartil	0	0	0 43/136
34 Maravedies		a Rial	0	0	5 3/8
2 Rials		a Piſtarine	0	0	10 3/4
8 Rials		†a Piaſtre of Ex.	0	3	7
10 Rials		a Dollar	0	4	6
375 Maravedies		†a Ducat of Ex.	0	4	11 1/2
32 Rials		†a Piſtole of Ex.	0	14	4
36 Rials		a Piſtole	0	16	9

Gibraltar, Malaga, Denia, &c. Velon.

			£.	s.	d.
† A Maravedie			0	0	0 43/510
2 Maravedies	=	a Ochavo	0	0	0 43/255
4 Maravedies		a Quartil	0	0	0 86/255
34 Maravedies		†a Rial Velon	0	0	2 13/15
15 Rials		†a Piaſtre of Ex.	0	3	7
512 Maravedies		a Piaſtre	0	3	7
60 Rials		†a Piſtole of Ex.	0	14	4
2048 Maravedies		a Piſtole of Ex.	0	16	9
78 Rials		a Piſtole	0	16	9

Barcelona, Saragoſſa, Valencia, &c. Old Plate.

			£.	s.	d.
A Maravedie			0	0	0 27/128
16 Maravedies	=	a Soldo	0	0	3 3/8
2 Soldos		a Rial Old Plate	0	0	6 3/4
20 Soldos		†a Libra	0	5	7 1/2
24 Soldos		†a Ducat	0	6	9
16 Soldos		†a Dollar	0	4	6
22 Soldos		†a Ducat	0	6	2 1/4
21 Soldos		†a Ducat	0	5	10 7/8
60 Soldos		a Piſtole	0	16	9

ITALY

GENOA. *Novi, &c.* CORSICA. *Baſtia, &c.*

			£.	s.	d.
A Denari			0	0	0 7/200
12 Denari	=	a Soldi	0	0	0 21/50
4 Soldi		a Chevalet	0	0	1 17/25
20 Soldi		†a Lire	0	0	8 2/5
30 Soldi		a Teſtoon	0	1	0 9/15

EUROPE, Southern Parts.

ITALY.

GENOA, &c.

			£.	s.	d.	
5 Lires	=	a Croiſade	0	3	7	
115 Soldi		†a Pezzo of Ex.	0	4	2	
6 Teſtoons		a Genouine	0	6	2	
20 Lires		a Piſtole -	0	14	4	

PIEDMONT, SAVOY, AND SARDINIA.

Turin, Chamberry, Cagliari, &c.

A Denari	-	- -	0	0	0	$\frac{1}{16}$
3 Denari	=	a Quatrini	0	0	0	$\frac{3}{16}$
12 Denari		a Soldi -	0	0	0	$\frac{3}{4}$
12 Soldi		†a Florin -	0	0	9	
20 Soldi		†a Lire -	0	1	3	
6 Florins		a Scudi -	0	4	6	
7 Florins		a Ducatoon	0	5	3	
13 Lires		a Piſtole -	0	16	3	
16 Lires		a Louis d'Or	1	0	0	

Milan, Modena, Parma, Pavia, &c.

A Denari	-	- -	0	0	0	$\frac{3}{32}$
3 Denari	=	a Quatrini -	0	0	0	$\frac{9}{32}$
12 Denari		a Soldi -	0	0	0	[illegible]
20 Soldi		†a Lire -	0	0	8	[illegible]
115 Soldi		a Scudi current	0	4	2	$\frac{1}{4}$
117 Soldi		†a Scudi of Ex.	0	4	3	
6 Lires		a Philip -	0	4	4	$\frac{1}{2}$
22 Lires		a Piſtole -	0	16	0	
23 Lires		a Spaniſh Piſtole	0	16	9	

Leghorn, Florence, &c.

A Denari	-	- -	0	0	0	$\frac{5}{144}$
4 Denari	=	a Quatrini	0	0	0	[illegible]
12 Denari		a Soldi -	0	0	0	$\frac{5}{12}$
5 Quatrini		a Craca -	0	0	0	$\frac{25}{36}$
8 Cracas		a Quilo -	0	0	5	$\frac{5}{6}$
20 Soldi		†a Lire -	0	0	8	$\frac{1}{3}$
6 Lires		a Piaſtre of Ex.	0	4	2	
7½ Lires		a Ducat -	0	5	2	$\frac{1}{2}$
22 Lires		a Piſtole -	0	15	6	

ROME, *Civita Vecchia, Ancona.*

A Quatrini	-	- -	0	0	0	$\frac{3}{20}$
5 Quatrini	=	a Bayoc -	0	0	0	$\frac{3}{4}$
8 Bayocs		a Julio -	0	0	6	
10 Bayocs		a Stampt Julia	0	0	7	$\frac{1}{2}$
24 Bayocs		a Teſtoon	0	1	6	
10 Julios		a Crown current	0	5	0	
12 Julios		†a Crown ſtampt	0	6	0	
18 Julios		a Chequin	0	9	0	
31 Julios		a Piſtole -	0	15	6	

NAPLES. *Gaieta, Capua, &c.*

A Quatrini	-	- .	0	0	0	$\frac{2}{15}$
3 Quatrini	=	a Grain -	0	0	0	$\frac{2}{5}$
10 Grains		a Carlin -	0	0	4	
40 Quatrini		a Paulo -	0	0	5	$\frac{1}{3}$
20 Grains		a Tarin -	0	0	8	
40 Grains		a Teſtoon -	0	1	4	
100 Grains		a Ducat of Ex.	0	3	4	
23 Tarins		a Piſtole -	0	15	4	
25 Tarins		a Spaniſh Piſtole	1	16	9	

SICILY and MALTA. *Palermo, Messina, &c.*

			£.	s.	d.	
A Pichila	-	-	0	0	0	[illegible]
6 Pichili	=	a Grain -	0	0	0	[illegible]
8 Pichili		a Ponti -	0	0	0	[illegible]
10 Grains		a Carlin -	0	0	1	[illegible]
20 Grains		a Tarin -	0	0	3	[illegible]
6 Tarins		†a Florin of Ex.	0	1	6	[illegible]
13 Tarins		a Ducat of Ex.	0	3	4	
60 Carlins		†an Ounce	0	7	8	[illegible]
2 Ounces		a Piſtole	0	15	4	

Bologna, Ravenna, &c.

A Quatrini	-	- -	0	0	0	$\frac{1}{5}$
6 Quatrini	=	a Bayoc -	0	0	0	$\frac{3}{5}$
10 Bayocs		†a Julio -	0	0	6	
20 Bayocs		a Lire -	0	1	0	
3 Julios		a Teſtoon -	0	1	6	
80 Bayocs		a Schudi of Ex.	0	4	3	
105 Bayocs		a Ducatoon	0	5	3	
100 Bayocs		a Crown -	0	5	0	
31 Julios		a Piſtole -	0	15	6	

VENICE. *Bergham, &c.*

A Picoli	-	- -	0	0	0	[illegible]
12 Picoli	=	a Soldi -	0	0	0	[illegible]
6¼ Soldi		†a Gros -	0	0	2	$\frac{1}{6}$
18 Soldi		a Jule -	0	0	6	
20 Soldi		†a Lire -	0	0	6	$\frac{2}{3}$
3 Jules		a Teſtoon	0	1	6	
124 Soldi		a Ducat Current	0	3	5	[illegible]
24 Gros		†a Ducat of Ex.	0	4	4	
17 Lires		a Chequin -	0	9	2	

TURKY. *Morea, Candia, Cyprus, &c.*

A Mangar	-	- -	0	0	0	$\frac{3}{20}$
4 Mangars	=	†an Aſper -	0	0	0	$\frac{3}{5}$
3 Aſpers		a Parac -	0	0	1	$\frac{4}{5}$
5 Aſpers		a Beſtic -	0	0	3	
10 Aſpers		an Oſtic -	0	0	6	
20 Aſpers		a Solota -	0	1	0	
80 Aſpers		†a Piaſtre -	0	4	0	
100 Aſpers		a Caragrouch	0	5	0	
10 Solotas		a Xeriff -	0	10	0	

ASIA.

ARABIA. *Medina, Mecca, Mocha, &c.*

A Carret	-	- -	0	0	0	[illegible]
5¼ Carrets	=	a Caveer -	0	0	0	[illegible]
7 Carrets		a Comaſhee	0	0	0	[illegible]
80 Carrets		a Larin -	0	0	10	$\frac{1}{2}$
18 Comaſhees		an Abyſs	0	1	4	$\frac{1}{2}$
60 Comaſhees		†a Piaſtre -	0	4	6	
80 Caveers		a Dollar -	0	4	6	
100 Comaſhees		a Sequin -	0	7	6	
80 Larins		†a Tomond	3	7	6	

PERSIA. *Iſpahan, Ormus, Gombroon, &c.*

A Coz	-	- -	0	0	0	[illegible]
4 Coz	=	a Biſti -	0	0	1	$\frac{3}{5}$
10 Coz		a Shahee -	0	0	4	
20 Coz		a Mamooda	0	0	8	
25 Coz		a Larin -	0	0	10	
4 Shahees		an Abaſhee	0	1	4	

ASIA.

MOGUL.

			£.	s.	d.
5 Abaſhees	=	an Or -	0	8	6
12 Abaſhees		a Bovello -	0	16	0
50 Abaſhees		†a Tomond	3	6	8

GUZZURAT. *Surat, Cambay, &c.*

			£.	s.	d.
A Pecka			0	0	0 $\frac{15}{64}$
2 Peckas	=	a Pice -	0	0	0 $\frac{15}{32}$
4 Pices		a Fanam -	0	0	1 $\frac{7}{8}$
5 Pices		a Viz -	0	0	2 $\frac{11}{32}$
10 Pices		an Ana -	0	0	7 $\frac{1}{2}$
4 Anas		a Rupee -	0	2	6
2 Rupees		an Engliſh Crown	0	5	0
14 Anas		a Pagoda -	0	8	9
4 Pagodas		a Gold Rupee	1	15	0

MALABAR.

Bombay, Dabul, &c.

			£.	s.	d.
†A Budgrook - -			0	0	0 $\frac{27}{800}$
2 Budgrooks	=	†a Re -	0	0	0 $\frac{27}{400}$
5 Rez		a Pice	0	0	0 $\frac{27}{80}$
16 Pices		a Laree	0	0	5 $\frac{2}{5}$
20 Pices		a Quarter	0	0	6 $\frac{3}{4}$
240 Rez		a Xeraphim	0	1	4 $\frac{1}{5}$
4 Quarters		a Rupee	0	2	3
14 Quarters		a Pagoda	0	8	0
60 Quarters		a Gold Rupee	1	15	0

Goa, Viſapour, &c.

			£.	s.	d.
†A Re - -			0	0	0 $\frac{27}{400}$
2 Rez	=	a Bazaraco	0	0	0 $\frac{27}{200}$
2 Bazaracos		a Pecka -	0	0	0 $\frac{27}{100}$
20 Rez		a Vintin	0	0	1 $\frac{7}{20}$
4 Vintins		a Laree	0	0	5 $\frac{2}{5}$
3 Larees		a Xeraphim	0	1	4 $\frac{1}{5}$
42 Vintins		a Tangu	0	4	6
4 Tangus		a Paru	0	18	0
8 Tangus		a Gold Rupee	1	15	0

COROMANDEL. *Madraſs, Pondicherry, &c.*

			£.	s.	d.
A caſh - - -			0	0	0 $\frac{5}{32}$
5 Caſh	=	a Viz -	0	0	0 $\frac{3}{16}$
2 Viz		a Pice -	0	0	0 $\frac{3}{8}$
6 Pices		a Pical -	0	0	2 $\frac{1}{4}$
8 Pices		a Fanam -	0	0	3
10 Fanams		a Rupee -	0	2	6
2 Rupees		an Engliſh Crown	0	5	0
36 Fanams		a Pagoda -	0	8	9
4 Pagodas		a Gold Rupee	1	15	0

BENGAL. *Callicut, Calcutta, &c.*

			£.	s.	d.
A Pice - - -			0	0	0 $\frac{5}{32}$
4 Pices	=	a Fanam -	0	0	0 $\frac{5}{8}$
6 Pices		a Viz -	0	0	0 $\frac{15}{16}$
12 Pices		an Ana -	0	0	1 $\frac{7}{8}$
10 Anas		a Fiano -	0	1	6 $\frac{3}{4}$
16 Anas		a Rupee -	0	2	6
2 Rupees		a French Ecu	0	5	0
2 Rupees		an Engliſh Crown	0	5	0
56 Anas		a Pagoda -	0	8	9

ASIA.

SIAM. *Pegu, Malacca, Cambodia, Sumatra, Java, Borneo, &c.*

			£.	s.	d.
A Cori - - - - -			0	0	0 $\frac{3}{40000}$
800 Cori	=	a Fettee	0	0	0 $\frac{3}{50}$
125 Fettees		a Sataleer -	0	0	7 $\frac{1}{2}$
250 Fettees		a Sooco -	0	1	3
500 Fettees		a Tutal -	0	2	6
900 Fettees		a Dollar -	0	4	6
2 Ticals		a Rial -	0	5	0
4 Soocos		an Ecu -	0	5	0
8 Sateleers		a Crown -	0	5	0

CHINA. *Pekin, Canton, &c.*

			£.	s.	d.
A Caxa - - -			0	0	0 $\frac{2}{25}$
10 Caxa	=	a Candereen -	0	0	0 $\frac{4}{5}$
10 Candereens		a Mace -	0	0	8
35 Candereens		a Rupee -	0	2	6
2 Rupees		a Dollar -	0	4	6
70 Candereens		a Rix-dollar -	0	4	4 $\frac{1}{2}$
7 Maces		an Ecu -	0	5	0
2 Rupees		a Crown -	0	5	0
10 Maces		†a Tale -	0	6	8

JAPAN. *Jedda, Meaco, &c.*

			£.	s.	d.
A Piti - - - -			0	0	0 $\frac{1}{5}$
20 Pitis	=	a Mace -	0	0	4
15 Maces		an Ounce Silver	0	4	10 $\frac{1}{2}$
20 Maces		a Tale -	0	6	8
30 Maces		an Ingot -	0	9	8 $\frac{2}{5}$
13 Ounces Silver		an Ounce Gold	3	3	0
2 Ounces Gold		a Japaneſe -	6	6	0
2 Japaneſes		a Double -	12	12	0
21 Ounces Gold		†a Cattee -	66	3	0

AFRICA.

EGYPT. *Old and New Cairo, Alexandria, Sayde, &c.*

			£.	s.	d.
An Aſper - - -			0	0	0 $\frac{5}{9}$
3 Aſpers	=	a Medin -	0	0	1 $\frac{2}{3}$
24 Medins		an Italian Ducat	0	3	4
80 Aſpers		†a Piaſtre -	0	4	0
30 Medins		a Dollar -	0	4	6
96 Aſpers		an Ecu - -	0	5	0
32 Medins		a Crown -	0	5	0
200 Aſpers		a Sultanin -	0	10	0
70 Medins		a Pargo Dollar -	0	10	0

BARBARY *Algiers, Tunis, Tripoli, Una, &c.*

			£.	s.	d.
An Aſper - - - -			0	0	0 $\frac{5}{9}$
3 Aſpers	=	a Medin -	0	0	1 $\frac{2}{3}$
10 Aſpers		a Rial old Plate	0	0	6 $\frac{3}{4}$
2 Rials		a Double -	0	1	1 $\frac{1}{2}$
4 Doubles		a Dollar -	0	4	6
24 Medins		a Silver Chequin	0	3	4
30 Medins		a Dollar -	0	4	6
180 Aſpers		a Zequin -	0	8	10
15 Doubles		a Piſtole -	0	16	9

MOROCCO. *Santa Cruz, Mequinez, Fez, Tangiers, Sallee, &c.*

			£.	s.	d.
A Fluce - -			0	0	0 $\frac{1}{12}$
24 Fluces	=	a Blanquil -	0	0	2

MOROCCO, &c.

AFRICA.

			£.	s.	d.
4 Blanquils	=	an Ounce	0	0	8
7 Blanquils		an octavo	0	1	2
14 Blanquils		a Quarto	0	2	4
2 Quartos		a Medio	0	4	8
28 Blanquils		a Dollar	0	4	6
54 Blanquils		a Xequin	0	9	0
100 Blanquils		a Piſtole	0	16	9

AMERICA. West-Indies.

ENGLISH. *Jamaica, Barbadoes, &c.*

			£.	s.	d.
† Halfpenny			0	0	0 [illegible]
2 Halfpence	=	†a Penny	0	0	0 [illegible]
7½ Pence		a Bit	0	0	5 [illegible]
12 Pence		†a Shilling	0	0	8 [illegible]
75 Pence		a Dollar	0	4	6
7 Shillings		a Crown	0	5	0
20 Shillings		†a pound	0	14	3
24 Shillings		a Piſtole	0	16	9
30 Shillings		a Guinea	1	1	0

FRENCH. *St Domingo, Martinico, &c.*

			£.	s.	d.
† A Half Sol			0	0	0 [illegible]
2 Half Sols	=	†a Sol	0	0	0 [illegible]
7½ Sols		a Half Scalin	0	0	2 [illegible]
15 Sols		a Scalin	0	0	5 ⅜
20 Sols		†a livre	0	0	7 [illegible]
7 Livres		a Dollar	0	4	6
8 Livres		an Ecu	0	4	10 ½
26 Livres		a Piſtole	0	16	9
32 Livres		a Louis d'Or	1	0	0

AMERICA. Continent.

ENGLISH. *Nova Scotia, Virginia, New England, &c.*

			£.	s.	d.
† A Penny			0	0	1
12 Pence	=	†a ſhilling	0	1	0
20 Shillings		†a Pound	1	0	0
2 Pounds					
3 Pounds					
4 Pounds					
5 Pounds					
6 Pounds					
7 Pounds					
8 Pounds					
9 Pounds					
10 Pounds					

The value of the Currency alters according to the Plenty or Scarcity of Gold and Silver Coins that are imported.

Canada, Florida, Cayenna, &c.

† A Denier		
12 Deniers	=	†a Sol.
20 Sols		†a Livre.
2 Livres		
3 Livres		
4 Livres		
5 Livres		
6 Livres		
7 Livres		
8 Livres		
9 Livres		
10 Livres		

The value of the Currency alters according to the Plenty or Scarcity of Gold and Silver Coins that are imported.

Note. For all the *Spaniſh*, *Portugueſe*, *Dutch*, and *Daniſh* Dominions, either on the Continent or in the Weſt Indies, ſee the Moneys of the reſpective nations.

Ancient MONEY. See COINS and MEDALS.

Paper MONEY. See the article BANK.

Mongault. MONGAULT (Nicholas Hubert), an ingenious and learned Frenchman, and one of the beſt writers of his time, was born at Paris in 1674. At 16 he entered into the congregation of the fathers of the oratory, and was afterwards ſent to Mans to learn philoſophy. That of Ariſtotle then obtained in the ſchools, and was the only one which was permitted to be taught: nevertheleſs Mongault, with ſome of that original ſpirit which uſually diſtinguiſhes men of uncommon abilites from the vulgar, ventured in a public theſis which he read at the end of the courſe of lectures, to oppoſe the opinions of Ariſtotle, and to maintain thoſe of Des Cartes. Having ſtudied theology with the ſame ſucceſs, he quitted the oratory in 1699; and ſoon after went to Thoulouſe, and lived with Colbert archbiſhop of that place, who had procured him a priory in 1698. In 1710 the duke of Orleans, regent of the kingdom, committed to him the education of his ſon the duke of Chartres; which important office he diſcharged ſo well, that he acquired an univerſal eſteem. In 1714, he had the abbey of Chartreuve given him, and that of Villeneuve in 1719. The duke of Chartres, becoming colonel-general of the French infantry, choſe the Abbé Mongault to fill the place of ſecretary-general; made him alſo ſecretary of the province of Dauphiny; and, after the death of the regent his father, raiſed him to other conſiderable employments. All this while he was as aſſiduous as his engagements would permit in cultivating polite literature; and, in 1714, publiſhed at Paris, in 6 vols. 12mo. an edition of Tulley's Letters to Atticus, with an excellent French tranſlation, and judicious comment upon them. This work has been often reprinted and is juſtly reckoned admirable; for, as Middleton has obſerved, in the preface to his Life of Cicero, the Abbé Mongault "did not content himſelf with retailing the remarks of other commentators, or out of the rubbiſh of their volumes with ſelecting the beſt, but entered upon his taſk with the ſpirit of a true critic, and by the force of his own genius has happily illuſtrated many paſſages which all the interpreters before him had given up as inexplicable." He publiſhed alſo a very good tranſlation of Herodian from the Greek; the beſt edition of which is that of 1745, in 12mo. He died at Paris in 1746, He was a member of the French academy, and of the academy of inſcriptions and belles lettres; and was fitted to do honour to any ſociety.

Mongooz. MONGOOZ, in zoology. See LEMUR.

Monk. MONK anciently denoted, "a perſon who retired from the world to give himſelf up wholly to God, and to live in ſolitude and abſtinence." The word is derived from the Latin *monachus*, and that from the Greek μοναχος, "ſolitary;" of μονος *ſolus*, "alone."

The original of monks ſeems to have been this: The perſecutions which attended the firſt ages of the Goſpel forced ſome Chriſtians to retire from the world, and live in deſarts and places moſt private and unfrequented in hopes of finding that peace and comfort among beaſts which were denied them among men. And this being the caſe of ſome very extraordinary perſons, their example gave ſo much reputation to retirement, that the practice was continued when the reaſon of its commencement ceaſed. After the empire became Chriſtian, inſtances of this kind were numerous; and thoſe whoſe ſecurity had obliged them to live ſeparately and apart, became afterwards united into ſocieties. We may alſo add, that the myſtic theology, which gained ground towards the cloſe of the third century, contributed to produce the ſame effect, and to drive men into ſolitude for the purpoſes of enthuſiaſtic devotion.

The monks, at leaſt the ancient ones, were diſtinguiſhed into *ſolitaires*, *cœnobites*, and *ſarabaites*.

The *ſolitary* are thoſe who live alone, in places remote from all towns and habitations of men, as do ſtill ſome of the hermits.—The *cœnobites* are thoſe who live in community with ſeveral others in the ſame houſe, and under the ſame ſuperiors.—The *ſarabaites* were ſtrolling monks, having no fixed rule or reſidence.

The houſes of monks again were of two kinds, viz. *monaſteries* and *lauræ*. See Monastery and Laura.

Thoſe we call monks now-a-days are cœnobites, who live together in a convent or monaſtery, who make vows of living according to a certain rule eſtabliſhed by the founder, and wear a habit which diſtinguiſhes their order.

Thoſe that are endowed, or have a fixed revenue, are moſt properly called monks, *monachi*; as the Chartreux, Benedictines, Bernardines, &c. The Mendicants, or thoſe that beg, as the Capuchins and Franciſcans, are more properly called *religious* and *friars*; though the names are frequently confounded.

The firſt monks were thoſe of St Antony; who, towards the cloſe of the fourth century, formed them into a regular body, engaged them to live in ſociety with each other, and preſcribed to them fixed rules for the direction of their conduct. Theſe regulations, which Antony had made in Egypt, were ſoon introduced into Paleſtine and Syria by his diſciple Hilarion. Almoſt about the ſame time, Aones or Eugenius, with their companions Gaddanas and Azyzas, inſtituted the monaſtic order in Meſopotamia and the adjacent countries; and their example was followed with ſuch rapid ſucceſs, that in a ſhort time the whole eaſt was filled with a lazy ſet of mortals, who, abandoning all human connections, advantages, pleaſures, and concerns, wore out a languiſhing and miſerable life amidſt the hardſhips of want, and various kinds of ſuffering, in order to arrive at a more cloſe and rapturous communication with God and angels.

From the eaſt this gloomy inſtitution paſſed into the weſt, and firſt into Italy and its neighbouring iſlands; though it is uncertain who tranſplanted it thither. St Martin, the celebrated biſhop of Tours, erected the firſt monaſteries in Gaul, and recommended this religious ſolitude with ſuch power and efficacy, both by his inſtructions and his example, that his funeral is ſaid to have been attended by no leſs than 2000 monks. From hence the monaſtic diſcipline extended gradually its progreſs through the other provinces and countries of Europe. There were beſides the monks of St Baſil (called in the eaſt *Caloyers*, from καλος γερων "good old man") and thoſe of St Jerom, the hermits of St Auguſtine, and afterwards thoſe of St Benedict and St Bernard; at length came thoſe of St Francis and St Dominic, with a legion of others; all which ſee under their proper heads, Benedictines, &c.

Towards the cloſe of the 5th century, the monks, who had formerly lived only for themſelves in ſolitary retreats, and had never thought of aſſuming any rank among the ſacerdotal order, were now gradually diſtinguiſhed from the populace, and endowed with ſuch opulence and honourable privileges, that they found themſelves in a condition to claim an eminent ſtation among the ſupports and pillars of the Chriſtian community. The fame of their piety and ſanctity was ſo great, that biſhops and preſbyters were often choſen out of their order; and the paſſion of erecting edifices and convents, in which the monks and holy virgins might ſerve God in the moſt commodious manner, was at this time carried beyond all bounds. However, their licentiouſneſs, even in this century, was become a proverb; and they are ſaid to have excited the moſt dreadful tumults and ſeditions in various places. The monaſtic orders were at firſt under the immediate juriſdiction of the biſhops, from which they were exempted by the Roman pontiff about the end of the 7th century; and the monks, in return, devoted themſelves wholly to advance the intereſts and to maintain the dignity of the biſhop of Rome. This immunity which they obtained was a fruitful ſource of licentiouſneſs and diſorder, and occaſioned the greateſt part of the vices with which they were afterwards ſo juſtly charged. In the 8th century the monaſtic diſcipline was extremely relaxed both in the eaſtern and weſtern provinces, and all efforts to reſtore it were ineffectual. Nevertheleſs, this kind of inſtitution was in the higheſt eſteem, and nothing could equal the veneration that was paid about the cloſe of the 9th century to ſuch as devoted themſelves to the ſacred gloom and indolence of a convent. This veneration induced ſeveral kings and emperors to call them to their courts, and to employ them in civil affairs of the greateſt moment. Their reformation was attempted by Lewis the Meek, but the effect was of ſhort duration. In the 11th century they were exempted by the popes from the authority of their ſovereigns, and new orders of monks were continually eſtabliſhed; inſomuch that in the council of Lateran that was held in the year 1215, a decree was paſſed, by the advice of Innocent III. to prevent any new monaſtic inſtitutions; and ſeveral were entirely ſuppreſſed. In the 15th and 16th centuries, it appears, from the teſtimonies of the beſt writers, that the monks were generally lazy, illiterate, profligate, and licentious Epicureans, whoſe views in life were confined to opulence, idleneſs, and pleaſure. However, the Reformation had a manifeſt influence in reſtraining their exceſſes, and rendering them more circumſpect and cautious in their external conduct.

Monks are diſtinguiſhed by the colour of their habits into *black*, *white*, *grey*, &c. Among the monks, ſome are called *monks of the choir*, others *profeſſed monks*, and others *lay monks*; which laſt are deſtined for the ſervice of the convent, and have neither clericate nor literature

Cloiſtered MONKS, are thoſe who actually reſide in the houſe; in oppoſition to *extra*-monks, who have benefices depending on the monaſtery.

Monks are alſo diſtinguiſhed into *reformed*, whom the civil and eccleſiaſtical authority have made maſters of ancient convents, and put in their power to retrieve the ancient diſcipline, which had been relaxed; and *ancient*, who remain in the convent, to live in it according to its eſtabliſhment at the time when they made their vows, without obliging themſelves to any new reform.

Anciently the monks were all laymen, and were only diſtinguiſhed from the reſt of the people by a particular habit and an extraordinary devotion. Not only the monks were prohibited the prieſthood, but even prieſts were expreſsly prohibited from becoming monks, as appears from the letters of St Gregory. Pope Syricius was the firſt who called them to the clericate, on occaſion of ſome great ſcarcity of prieſts, that the church was then ſuppoſed to labour under: and ſince that time, the prieſthood has been uſually united to the monaſtical profeſſion.

MONK (George), a perſonage memorable for having been the principal agent in reſtoring Charles II. to his crown, was deſcended from a very ancient family, and born in Devonſhire in 1608. Being an unprovided younger ſon, he dedicated himſelf to arms from his youth, and obtained a pair of colours in the expedition to the Iſle of Rhée: he ſerved afterwards in the Low Countries with reputation in both King Charles's northern expeditions; and did ſuch ſervice in quelling the Iriſh rebellion, that he was appointed governor of Dublin, but was ſuperſeded by parliamentary authority. Being made major-general of the Iriſh brigade employed in the ſiege of Nantwich in Cheſhire, he was taken priſoner by Sir Thomas Fairfax, and remained confined in the Tower of London until the year 1646; when, as the means of liberty, he took the covenant, and accepted a command in the Iriſh ſervice under the parliament. He obtained the command in chief of all the parliamentary forces in the north of Ireland, where he did ſignal ſervices, until he was called to account for a treaty made with the Iriſh rebels; a circumſtance which was only obliterated by his future good fortune. He ſerved in Scotland under Oliver Cromwell with ſuch ſucceſs, that he was left there as commander in chief; and he was one of the commiſſioners for uniting that kingdom with the new-erected commonwealth. He ſerved at ſea alſo againſt the Dutch; and was treated ſo kindly on his return, that Oliver is ſaid to have grown jealous of him. He was, however, again ſent to Scotland as commander in chief, and continued there five years; when he diſſembled ſo well, and improved circumſtances ſo dextrouſly, that he aided the deſires of a wearied people, and reſtored the king without any diſturbance; for which he was immediately rewarded both with honours and profit: (See BRITAIN, n° 194, &c.)—He was created duke of Albemarle, with a grant of 7000 l. *per annum* eſtate, beſide other emoluments; and enjoyed the confidence of his maſter without forfeiting that of the people. After his death in 1670, there was publiſhed a treatiſe compoſed by him while he remained priſoner in the Tower, intitled. "Obſervations on Military and Political Affairs," a ſmall folio.

MONK-*fiſh*. See SQUATINA.

MONKS-*Hood*, or *Wolf's bane*. See ACONITUM.

MONKEY, in zoology. See APE and SIMIA.

MONMOUTH (James, duke of), ſon to Charles II. by Mrs Lucy Watters, was born at Rotterdam in 1649. Upon the Reſtoration, he was called over to England, where the king received him with all imaginable joy, created him earl of Orkney (which was changed into that of Monmouth), and he took his ſeat in the houſe of peers in the enſuing ſeſſion of parliament. He married Anne, the heireſs of Francis earl of Buccleugh; and hence it came to paſs that he had alſo the title of *Buccleugh*, and took the ſurname of *Scot*, according to the cuſtom of Scotland. In 1668 his father made him captain of his life-guard of horſe; and in 1672 he attended the French king in the Netherlands, and gave proofs of bravery and conduct. In 1673 the king of France made him lieutenant general of his army, with which he came before Maeſtricht, and behaved himſelf with incredible gallantry, being the firſt who entered it himſelf. He returned to England, was received with all poſſible reſpect, and was received chancellor of the univerſity of Cambridge. After this he went to aſſiſt the prince of Orange to raiſe the ſiege of Mons, and did not a little contribute towards it. He returned to England; and was ſent, in quality of his father's general, to quell an inſurrection in Scotland, which he effected: but ſoon after he fell into diſgrace; for, being a proteſtant, he was deluded into ambitious ſchemes, upon the hopes of the excluſion of the duke of York: he conſpired againſt his father and the duke: and when the latter came to the throne by the title of *James II.* he openly appeared in arms, encouraged by the Proteſtant army; but coming to a deciſive battle before he had ſufficient forces to oppoſe the royal army, he was defeated, taken ſoon after concealed in a ditch, tried for high treaſon, condemned, and beheaded in 1685, aged 36. See BRITAIN, n° 242. 249—265.

MONMOUTH, the capital of the county of Monmouthſhire in England, 129 miles from London.—It has its name from its ſituation at the conflux of the Monow or Mynwy, and the Wye, over each of which it has a bridge, and a third over the Frothy.—Here was a caſtle in William the Conqueror's time, which Henry III. took from John Baron of Monmouth. It afterwards came to the houſe of Lancaſter, who beſtowed many privileges upon the town. Here Henry V. ſurnamed *of Monmouth*, was born. The famous hiſtorian Geoffrey was alſo born at this place. Formerly it gave the title of *earl* to the family of Carey, and of *duke* to king Charles the Second's eldeſt natural ſon; but now of *earl* to the Mordaunts, who are alſo earls of Peterborough. It is a populous and well built place, and carries on a conſiderable trade with Briſtol by means of the Wye. It has a weekly market, and three fairs.

Monmouthshire, a county of England; anciently reckoned a part of Wales, but in Charles the Second's time taken into the Oxford circuit, and made an Engliſh county. It is bounded on the north by Herefordſhire, on the eaſt by Gloceſterſhire, on the ſouth by the river Severn, and on the weſt by the Welch counties of Brecknock and Glamorgan. Its extent from north to ſouth is about 30 miles, from eaſt to weſt 26, and in circumference 110. It is ſubdivided into ſix hundreds; and contains ſeven market-towns, 127 pariſhes, about 6494 houſes, 38,900 inhabitants; but ſends only three members to parliament, that is, one for Monmouth, and two for the county. The air is temperate and healthy; and the ſoil fruitful, though mountainous and woody. The hills feed ſheep, goats, and horned cattle; and the valleys produce plenty of graſs and corn. This county is extremely well watered by ſeveral fine rivers; for, beſides the Wye, which parts it from Gloceſterſhire, the Mynow, which runs between it and Herefordſhire, and the Rumney, which divides it from Glamorganſhire, it has, peculiar to itſelf, the Uſk, which enters this county a little above Abergavenny, runs moſtly ſouthward, and falls into the Severn by the mouth of the Ebwith; which laſt river runs from north to ſouth, in the weſtern ſide of the county. All theſe rivers, eſpecially the Wye and Uſk, abound with fiſh, particularly ſalmon and trout.

MONNOYE (Bernard de la), born at Dijon in 1641, was a man of fine parts and great learning. He was admirably formed for poetry; and uſed to win the firſt prizes inſtituted by the members of the French academy, till he diſcontinued to write for them (it is ſaid) at the ſolicitation of the academy; a circumſtance which, if true, would reflect higher honour on him than a thouſand prizes. All his pieces are in a moſt exquiſite taſte; and he was no leſs ſkilful in Latin poetry than in the French. Menage and Bayle have both beſtowed the higheſt encomiums on his Latin poetry. His Greek poems are likewiſe looked upon as very good; and ſo are his Italian, which are written with great ſpirit. But poetry was not La Monnoye's only province: to a perfect ſkill in poetry, he joined a very accurate and extenſive knowledge of the languages. He had great ſkill in criticiſm; and no man applied himſelf with greater aſſiduity to the ſtudy of hiſtory, ancient and modern. He was perfectly acquainted with all the ſcarce books that had any thing curious in them; very well verſed in the hiſtory of the learned; and what completes all, is the wonderful clearneſs with which he poſſeſſed theſe various kinds of knowledge. He wrote Remarks on the Menagiana; in the laſt edition of which, in 4 vols 12mo, printed in 1715, are included ſeveral pieces of his poetry, and a curious diſſertation on the famous book *De tribus Impoſtoribus*. His Diſſertation on *Pomponius Lætus*, at leaſt an extract of it, is inſerted in the new edition of Baillet's *Jugemens des ſçavans*, publiſhed in 1722, with a great number of remarks and corrections by La Monnoye. He alſo embelliſhed the Anti-Baillet of Menage with a multitude of corrections and notes. It would employ ſeveral pages to enumerate the various ſervices this ingenious and learned man did to the republic of letters; as well by enriching it with productions of his own, as by the aſſiſtance which he communicated very freely upon all occaſions to the learned of his times. Thus, among others, he favoured Bayle with a great number of curious particulars for his Dictionary, and was highly applauded by him on that account. He died at Paris, October 15th, 1728, in his 88th year. —Mr de Sallinger publiſhed at the Hague A Collection of Poems by La Monnoye, with his elogium, from whence many of the above particulars are taken. He alſo left behind him a Collection of Letters, moſtly critical; ſeveral curious Diſſertations; 300 Select Epigrams from Martial, and other poets ancient and modern, in French verſe; ſeveral other works in proſe and verſe, in French, Latin, and Greek, all ready for the preſs.

MONNOYER (John Baptiſt), "one of the greateſt maſters (according to Mr Walpole) that has appeared for painting flowers. They are not ſo exquiſitely finiſhed as Van Huyſum's, but his colouring and compoſition are in bolder ſtyle." He was born at Liſle in 1635; and educated at Antwerp as a painter of hiſtory, which he ſoon changed for flowers. Going to Paris in 1663, he was received into the academy with applauſe; and employed at Verſailles, Trianon, Marly, and Meudon; and painted in the hotel de Bretonvilliers at Paris, and other houſes. The duke of Montague brought him to England; where much of his hand is to be ſeen, at Montague-houſe, Hampton-court, the duke of St Alban's at Windſor, Kenſington, Lord Carliſle's, Burlington-houſe, &c. But his moſt curious work is ſaid to be a looking glaſs at Kenſington palace, which he adorned with flowers for Queen Mary, who held him in ſuch high eſteem, that ſhe honoured him with her preſence nearly the whole time he was buſied in the performance.—Baptiſt paſſed and repaſſed ſeveral times between France and England; but having married his daughter to a French painter who was ſuffered to alter and touch upon his pictures, Baptiſt was offended and returned to France no more. He died in Pall-mall in 1699.—His ſon Antony, called *young Baptiſt*, painted in his father's manner, and had merit.

MONOCEROS, unicorn, in aſtronomy, a ſouthern conſtellation formed by Hevelius, containing in his catalogue 19 ſtars, and in the Britannic Catalogue 31.

MONOCEROS, in zoology. See Monodon.

MONOCHORD; an inſtrument by which we are enabled to try the ſeveral proportions of muſical ſounds and intervals, as well in the natural as in tempered ſcales. Originally it had, as its name implies, only one ſtring; but it is better conſtructed with two, as we have by means of this additional ſtring an opportunity of judging of the harmony of two tempered notes in every poſſible variety of temperament (ſee Temperament and tuning). It conſiſts of a braſs rule placed upon a ſound-board, and accurately divided into different ſcales according to the purpoſes for which it is chiefly intended. Above this rule the ſtrings are to be ſtretched over two fixed bridges, between which there is a moveable fret, ſo contrived as to divide at pleaſure one of the ſtrings into the ſame proportional parts as are engraved upon the ſcales beneath. The figure of the inſtrument, the manner of

Monochord.

ſtriking the ſtrings ſo as to produce the ſound, as likewiſe the conſtruction of the moveable bridge, may be varied at pleaſure according to the wiſh and ingenuity of the artiſt: But with the aſſiſtance of ſuch an inſtrument accurately conſtructed, any perſon with a good ear may be enabled to tune a keyed inſtrument with ſufficient preciſion to anſwer every practical purpoſe.

The following table contains the chief ſcales that have hitherto been computed. In column 1ſt is given the natural ſcale, or ſcale of perfect intervals. The ſecond column contains a new tempered ſcale, which ſeems better adapted than any other to keyed inſtrument, when chiefly deſigned for leſſon playing, or playing without accompanyments. The third is a ſcale propoſed by Mr Emerſon in his Mechanics, and ſince recommended by Mr Jones in his Phyſiological Diſquiſitions, and by Mr Cavallo in the Philoſophical Tranſactions for 1788. The fourth and fifth exhibit the ſyſtems of mean tones, and of equal harmony, calculated by Dr Smith for inſtruments of a more perfect conſtruction than thoſe now in uſe.

Note.	Natural Scale.	Tempered Scale	Emerſon Jones, &c.	Mean Tones.	Equal harmony
C		1000			
C※	937.5	952.9	943.8	957	959.3
D♭				934.5	933
D	888.9	893.3	890.9	894.4	895
D※	833.3	837.5	840.8	856	858.6
E♭				836	835
E	800	798	793.7*	800	801
F♭				781	779
E※				765.6	768.5
F	750	748.1	749.1	747.6	747.4
F※	711.1	712.9	707.1	715.5	717
G♭				698.7	697.3
G	666.7	668.3	667.4	668.7	669
G※	625	632	629.9	640	641.7
A♭				625	624
A	600	597	594.6	598	598.7
A※	562.5	559.7	561.2	572.4	574.4
B♭				559	558.6
B	533.3	532.3	529.7*	535	536
C♭				522.4	521
B※				512	514
C	500	500	500	500	500

N. B. Mr Jones propoſes to have the two numbers which are denoted by ſtars reſpectively altered to the numbers 796 and 531.

The method of tuning any inſtrument by means of the monochord is as follows: Firſt, you muſt tune the C of the monochord to the concert pitch by means of a tuning-fork; next, you are to put the middle C of your inſtrument in perfect uniſon with the C of the monochord: Then move the ſliding fret to the next diviſion on the ſcale, and proceed in the ſame manner with all the ſeveral notes and half notes within the compaſs of an octave. When this is done with accuracy, the other keys are all to be tuned, by comparing them with the octave which is already tempered. [The monochord is here ſuppoſed to be made to the pitch of C; but this may be varied at the will of the conſtructor.]

Monochord.

The curious reader who may wiſh for further information reſpecting the conſtruction and uſe of monochords, will be highly gratified in peruſing the appendix of Mr Atwood's Treatiſe on Rectilinear Motion, and Mr Jones's ingenious and entertaining obſervations on the ſcale of muſic, monochord, &c. in his Phyſiological Diſquiſitions.

Monochord is alſo uſed for any muſical inſtrument that conſiſts of only one ſtring or chord; in this ſenſe the trumpet marine may properly be called a *monochord*.

MONOCULUS, in zoology; the name of a genus of inſects of the order of *aptera*, in the Linnæan ſyſtem. Its body is ſhort, of a roundiſh figure, and covered with a firm cruſtaceous ſkin; the fore-legs are ramoſe, and ſerve for leaping and ſwimming; it has but one eye, which is large, and compoſed of three ſmaller ones.

Of this genus, many of which have been reckoned among the microſcopic animals, authors enumerate a great number of ſpecies. The figure in Plate CCCXV. repreſents the quadricornis, or four-horned monoculus, a very ſmall ſpecies about half a line in length, and of an aſhen grey colour. From the head ariſe four antennæ, two forwards and two backwards; all four furniſhed with a few hairs, which give them the figure of a branch. Between the antennæ, on the fore part of the head, is ſituated a ſingle eye. From the head to the tail the body goes down, decreaſing in ſhape like a pear; and is compoſed of ſeven or eight rings, which grow continually more ſtraitened. The tail is long, divided into two; each diviſion giving riſe outwardly to three or four briſtly hairs. The animal carries its eggs on the two ſides of its tail in the form of two yellowiſh parcels filled with ſmall grains, and which taken together, nearly equal the inſect in bigneſs. This minute inſect is found in ſtanding pools. A number of them being kept in a bottle of water, ſome will be ſeen loaded with their eggs, and after a while depoſiting the two parcels, either jointly or ſeparately.

The name *monoculus* has been given to this genus, as conſiſting of individuals which apparently have but one eye: and from the manner in which they proceed forward in the water by leaping, they have alſo been called *water-fleas*. The branching antennæ ſerve them inſtead of oars, the legs being ſeldom uſed for ſwimming. "The tail, forked in ſome ſpecies, in others ſimple, ſerves them for a rudder. Their colour varies from white to green, and to red, more or leſs deep, doubtleſs in a ratio to the fragments of the vegetables on which they feed. The red tincture they ſometimes give to the water, has made ſome ignorant men think that the water had turned to blood. Too weak to be carnivorous, they on the contrary fall a prey to other aquatic inſects, even to polypi. Their body, compact and hard, is ſo tranſparent that in ſome the eggs with which the abdomen is filled are diſcernable. The water-parrot and the ſhell-monoculus, are remarkable. This latter is provided with a bivalvular ſhell, within which he ſhuts himſelf

Barbut's Genera of Inſects, p. 360.

Monodon.

himſelf up, if drawn out of the water. The ſhell opens underneath, the inſect puts forth its antennæ, by means of which it ſwims very expeditiouſly in various directions, ſeeking a ſolid body to adhere to, and then it is that it uſes its feet in walking, by ſtretching them out through the aperture of its ſhell.

"I preſerved a pair of theſe inſects (ſays our author), laſt year, in a ſmall glaſs tumbler, the one male the other female, having a bag filled with eggs affixed on each ſide the abdomen. In the ſpace of 14 days the increaſe was aſtoniſhing: it would have been impoſſible to have taken a ſingle drop of water out of the glaſs without taking with it either the larva or a young monoculus. I again repeated the experiment by ſelecting another pair; and at the expiration of the laſt 14 days my ſurpriſe was increaſed beyond meaſure. The contents of the glaſs appeared a maſs of quick-moving, animated matter; and being diverſified by colours of red, green, aſh-colour, white, &c. afforded with the aſſiſtance of the magnifier, conſiderable entertainment."

MONODON, in ichthyology, a genus of fiſhes belonging to the order of *cete;* the characters of which are: There are two very long, ſtraight, and ſpirally twiſted teeth, which ſtick out from the upper jaw; and the ſpiracle or breathing hole, is ſituated on the anterior part of the ſkull. There is but one ſpecies, the monoceros, or horned narwhal, which ſometimes grows to 25 feet in length, excluſive of the horn; but the uſual ſize is from 16 to 20. It is particularly noted for its horn or horns, as they are called; but which are real teeth. Of theſe there are always two in young animals; though the old ones have generally but one, ſometimes none. From the circumſtance of only one tooth being uſually found, the animal has acquired the name of *Unicorn Fiſh*, or *Sea Unicorn.* They inhabit the northern ſeas, from Norway to within the arctic circle: they are plentiful in Davis's ſtraits and the north of Greenland; where the natives, for want of wood, make rafters of the teeth. From the tooth or horn may be diſtilled a very ſtrong *ſal volatile:* the ſcrapings are eſteemed *alexipharmic*, and were uſed of old in malignant fevers and againſt the bites of ſerpents. The uſe of it to the animal ſeems to be chiefly as a weapon of offence, and a very powerful one it appears to be: there are many inſtances of its having been found in the bottoms of ſhips which returned from the northern ſeas, probably owing to the animal's having miſtaken the ſhip for a whale, and attacked it with ſuch fury as not to be able to get out the weapon from the wood. It may alſo ſerve as an inſtrument to looſen and diſengage from the rocks or bottom of the ſea the ſea plants on which it feeds. Theſe fiſhes ſwim ſwiftly, and can only be ſtruck when numbers happen to be found together, and obſtruct their own courſe with their teeth. Their ſkin is white, with black ſpots on the back, and has a great quantity of blubber underneath.

Plate CCCXV.

The tooth of this animal was in old times impoſed upon the world as the horn of an unicorn, and ſold at a very high price. The heirs of the chancellor to Chriſtian Friſius of Denmark, valued one at 8000 imperials. There is a magnificent throne made of this ſpecies of ivory for the Daniſh monarchs, which is ſtill preſerved in the caſtle at Roſenberg. The price of this material was ſuperior to gold.

Monody ‖ Monophyſites.

MONODY, in ancient poetry, a mournful kind of ſong, ſung by a perſon all alone, to give vent to his grief. The word is derived from μονος "alone," and κιρω "I ſing."

MONOECIA, from μονος *alone*, and οικια a *houſe;* the name of the 21ſt claſs in Linnæus's ſexual method. See BOTANY.

MONOGAMY, compounded of μονος *ſolus*, and γαμος "marriage," the ſtate or condition of thoſe who have only married once, or are reſtrained to a ſingle wife. See POLYGAMY.

MONOGLOSSUM (anc. geog.), a mart-town of the Hither India, ſituated on the Sinus Canthi, into which the Indus empties itſelf. Said to be Mangalor on the coaſt of Malabar. E. Long. 74°, N. Lat. 13°.

MONOGRAM, a character or cypher, compoſed of one, two, or more letters interwoven; being a kind of abbreviation of a name, anciently uſed as a ſeal, badge, arms, &c.

MONOGYNIA, from μονος *alone*, and γυνη a *woman;* the name of the firſt order or ſubdiviſion in the firſt 13 claſſes of Linnæus's ſexual method; conſiſting of plants which, beſides their agreement in their claſſic character, generally derived from the number of their ſtamina, have only one ſtyle, or female organ.

MONOMOTAPA, a country of Africa, has the maritime kingdom of Sofala on the eaſt, the river Del Spiritu Santo on the ſouth, the mountains of Caffraria on the weſt, and the river Cauma on the north, which parts it from Monoemugi. The air of this country is very temperate; the land fertile in paſtures and all the neceſſaries of life, being watered by ſeveral rivers. The inhabitants are rich in black cattle, which they value more than gold. They have a vaſt number of elephants, as appears from the great quantity of ivory that is exported from hence. There are many gold-mines, and the rivers that run through their veins carry a great deal of gold-duſt along with them. The inhabitants are lovers of war, which is the employment followed by all thoſe who do not apply themſelves to commerce. This country is divided into ſeven provinces or petty kingdoms, vaſſals to the king; viz. Monomotapa Proper, Quiteve, Manica, Inhambana, Inhemior, Sabia, and Sofala.

MONOPETALOUS, in botany, a term applied to flowers that have only one petal or flower-leaf.

MONOPHYSITES, (from μονος *ſolus*, and φυσις *natura*), a general name given to all thoſe ſectaries in the Levant who only own one nature in Jeſus Chriſt; and who maintain, that the divine and human nature of Chriſt were ſo united as to form only one nature, yet without any change, confuſion or mixture of the two natures.

The *monophyſites*, however, properly ſo called, are the followers of Severus, a learned monk of Paleſtine, who was created patriarch of Antioch in 513, and Petrus Fullenſis.

The monophyſites were encouraged by the emperor Anaſtaſius, but depreſſed by Juſtin and ſucceeding emperors. However, this ſect was reſtored by Jacob Baradæus an obſcure monk, inſomuch that when he died biſhop of Edeſſa, A. D. 538, he left it in a moſt flouriſhing ſtate in Syria, Meſopotamia, Armenia, Egypt, Nubia, Abyſſinia, and other countries. The laborious efforts of Jacob were ſeconded in Egypt and the adjacent countries, by Theodoſius biſhop of Alexandria; and he became ſo famous that all the monophyſites of the eaſt conſidered him as their ſecond parent and founder, and are to this day called *Jacobites*, in honour of their new chief. The monophoſites are divided into two ſects or parties, the one African, the other Aſiatic; at the head of the latter is the patriarch of Antioch, who reſides for the moſt part in the monaſtery of St. Ananias, near the city of Merdin: the former are under the juriſdiction of the patriarch of Alexandria, who generally reſides at Grand Cairo, and are ſubdivided into Cophts and Abyſſinians. From the 15th century downwards, all the patriarchs of the monophyſites have taken the name of *Ignatius*, in order to ſhow that they are the lineal ſucceſſors of Ignatius, who was biſhop of Antioch in the firſt century, and conſequently the lawful patriarchs of Antioch. In the 17th century, a ſmall body of the monophyſites in Aſia abandoned for ſome time the doctrine and inſtitution of their anceſtors, and embraced the communion of Rome: but the African monophyſites, notwithſtanding that poverty and ignorance which expoſed them to the ſeductions of ſophiſtry and gain, ſtood firm in their principles, and made an obſtinate reſiſtance to the promiſes, preſents, and attempts employed by the papal miſſionaries to bring them under the Roman yoke: and in the 18th century, thoſe of Aſia and Africa have perſiſted in their refuſal to enter into the communion of the Romiſh church, notwithſtanding the earneſt intreaties and alluring offers that have been made from time to time by the pope's legates, to conquer their inflexible conſtancy. The monophyſites propagate their doctrine in Aſia with zeal and aſſiduity, and have not long ago gained over to their communion a part of the Neſtorians, who inhabit the maritime coaſts of India.

MONOPOLY, one or more perſons making themſelves the ſole maſters of the whole of a commodity, manufacture and the like, in order to make private advantage of it, by ſelling it again at a very advanced price. Or it is a licence or privilege allowed by the ſtate for the ſole buying and ſelling, making, working, or uſing any thing whatſoever. Monopolies had been carried to a great height in England during the reign of Queen Elizabeth; and were heavily complained of by Sir Edward Coke, in the beginning of the reign of King James I.: but were in a great meaſure remedied by ſtatute 21 Jac. I. c. 3. which declares ſuch monopolies to be contrary to law, and void; except as to patents, not exceeding the grant of 14 years, to the authors of new inventions; and except alſo patents concerning printing, ſaltpetre, gunpowder, great ordnance, and ſhot); and monopoliſts are puniſhed with the forfeiture of treble damages and double coſts, to thoſe whom they attempt to diſturb; and if they procure any action brought againſt them for theſe damages to be ſtayed by any extrajudicial order, other than of the court wherein it is brought, they incur the penalties of *præmunire* Combinations alſo among victuallers or artificers, to raiſe the price of proviſions, or any commodities, or the rate of of labour, are in many caſes ſeverely puniſhed by particular ſtatute; and, in general, by ſtatute 2 & 3 Edward VI. c. 15. with the forfeiture of L.10. or 20 days impriſonment, with an allowance of only bread and water for the firſt offence: L.20 or the pillory for the ſecond; and L.10 for the third, or elſe the pillory, loſs of one ear, and perpetual infamy. In the ſame manner, by a conſtitution of the emperor Zego, all monopolies and combinations to keep up the price of merchandiſe, proviſions, or workmanſhip, were prohibited, upon pain of forfeiture of goods and perpetual baniſhment,

MONOSYLLABLE, in grammar, a word that conſiſts only of one ſyllable, and is compoſed either of one or more letters pronounced at the ſame time. The too frequent uſe of monoſyllables has a very bad effect in Engliſh poetry, as Mr Pope both intimates and exemplifies in the ſame verſe, viz.

> "And ten ſlow words oft creep in one dull line."

MONOTHELITES, (compounded of μονος ſingle, and θελημα "will," of θελω *volo* "I will"), an ancient ſect, which ſprung out of the Eutychians; thus called, as only allowing of one will in Jeſus Chriſt.

The opinion of the Monothelites had its riſe in 630, and had the emperor Heraclius for an adherent: it was the ſame with that of the Acephalous Severians. They allowed of two wills in Chriſt, conſidered with regard to the two natures; but reduced them to one, by reaſon of the union of the two natures; thinking it abſurd there ſhould be two free wills in one and the ſame perſon. They were condemned by the ſixth general council in 680, as being ſuppoſed to deſtroy the perfection of the humanity of Jeſus Chriſt, depriving it of will and operation. Their ſentiments were afterwards embraced by the Maronites.

MONOTONY, an uniformity of ſound, or a fault in pronunciation, when a long ſeries of words are delivered in one unvaried tune. See READING.

MONOTROPA, BIRD'S-NEST, A genus of the monogynia order, belonging to the monandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. There is no calyx, but 10 petals: and of theſe the five exterior have a melliferous hollow at the baſe. The capſule is quinquevalved. In ſome of the flowers a fifth part of the number is excluded as in the *M. Hippopithys*. There are two ſpecies; of which the only remarkable one is the hippopithys, a native of Britain and ſome of the more northerly kingdoms of Europe. It is about five inches high, having no other leaves than oval ſcales, and terminated with a nodding ſpike of flowers, which in the ſeeding ſtate becomes erect: the whole plant is of a pale yellow colour, ſmelling like the primroſe, or like beans in bloſſom. The country people in Sweden give the dried plant to cattle that have a cough.

MONREAL. See MONTREAL.

MONRO (Dr Alexander, ſenior), a moſt eminent phyſician and anatomiſt, was deſcended by his father from the family of Monro of Milton, which had large poſſeſſions in the county of Roſs; and by his mother, from that of Forbes of Culloden.

His father John, youngeſt ſon of Sir Alexander Monro of Bearcrofts, was bred to phyſic and ſurgery, and ſerved for ſome years as a ſurgeon in the army under King William in Flanders; but, for ſeveral ſucceſſive years, obtaining leave of abſence from the army in the winter, he during that ſeaſon reſided with his wife in London, where his ſon Alexander was born in the year 1697. About three years thereafter, he quitted the army, and went to ſettle as a ſurgeon at Edinburgh; where his knowledge in his profeſſion, and engaging manners, ſoon introduced him into an extenſive practice.

The ſon ſhowed an inclination to the ſtudy of phyſic; and the father, after giving him the beſt education that Edinburgh then afforded, ſent him ſucceſſively to London, Paris, and Leyden, to improve himſelf further in his profeſſion. At London, he attended the lectures of Meſſrs Haukſbee and Whiſton on experimental philoſophy, and the anatomical demonſtrations of Mr Cheſelden. At Paris, he attended the hoſpitals, and the lectures which were read on the different branches of phyſic and ſurgery at that time. Towards the end of autumn 1718, he went to Leyden, and ſtudied under the great Boerhaave; by whom he was particularly eſteemed.

On his return to Edinburgh in autumn 1719, Meſſrs Drummond and Macgill, who were then conjunct nominal profeſſors and demonſtrators of anatomy to the ſurgeons company, having reſigned in his favour, his father prevailed on him to read ſome public lectures on anatomy; and to illuſtrate them by ſhowing the curious anatomical preparations which he had made and ſent home when abroad. He at the ſame time perſuaded Dr Alſton, then a young man, to give ſome public lectures on botany. Accordingly, in the beginning of the winter 1720, theſe two young profeſſors began to give regular courſes of lectures, the one on the materia medica and botany, the other on anatomy and ſurgery; which were the firſt regular courſes of lectures on any of the branches of medicine that had ever been read at Edinburgh, and may be looked upon as the opening of that medical ſchool which has ſince acquired ſuch great reputation all over Europe.

In ſummer 1721 and 1722, Dr Monro, by the perſuaſion of his father, read ſome lectures on chirurgical ſubjects; particularly on wounds and tumors, which he never would publiſh, having wrote them in a hurry and before he had much experience; but inſerted from time to time the improvements he thought might be made in ſurgery, in the volumes of Medical Eſſays and Obſervations to be hereafter mentioned.

About the year 1720, his father communicated to the phyſicians and ſurgeons at Edinburgh, a plan, which he had long formed in his own mind, of having the different branches of phyſic and ſurgery regularly taught at Edinburgh; which was highly approved of by them, and by their intereſt regular profeſſorſhips of anatomy and medicine were inſtituted in the univerſity. His ſon, Dr Monro, was firſt made univerſity-profeſſor of anatomy; and two or three years afterwards, Drs Sinclair, Rutherford, Innes, and Plummer, were made profeſſors of medicine; the profeſſorſhip of materia medica and botany, which Dr Alſton then held, having been added to the univerſity many years before. Immediately after theſe gentlemen were elected profeſſors, they began to deliver regular courſes of lectures on the different branches of medicine, and they and their ſucceſſors have uniformly continued ſo to do every winter,

The plan for a medical education at Edinburgh was ſtill incomplete without an hoſpital, where ſtudents could ſee the practice of phyſic and ſurgery, as well as hear the lectures of the profeſſors. A ſcheme was therefore propoſed by Dr Monro's father, and others, particularly the members of the royal college of phyſicians and board of ſurgeons, for raiſing by ſubſcription a fund for building and ſupporting an hoſpital for the reception of diſeaſed poor; and our author publiſhed a pamphlet ſetting forth the advantages that would attend ſuch an inſtitution. In a ſhort time a conſiderable ſum of money was raiſed, a ſmall houſe was fitted up, and patients were admitted into it, and regularly attended by many of the phyſicians and ſurgeons in town. The fund for this charity increaſing very conſiderably, in a great meaſure from the activity and influence of that very worthy citizen and magiſtrate George Drummond, Eſq; the foundation was laid of the preſent large, commodious, and uſeful hoſpital, the *Royal Infirmary*: in the planning of which Dr Monro ſuggeſted many uſeful hints, and in particular the elegant room for chirurgical operations was deſigned and executed under his direction. Provoſt Drummond and he were nominated the building committee; and the fabric was entirely completed in a ſhort ſpace of time. It has ſince been ſo largely endowed, as to be capable of receiving a great number of diſeaſed poor, whoſe caſes the ſtudents of phyſic and ſurgery have an opportunity of ſeeing daily treated with the greateſt attention and care, by phyſicians and ſurgeons eminent in their profeſſion; and a regiſter of the particulars of all the caſes which have been received into the houſe ſince its firſt opening has been kept, in books appropriated for that purpoſe, for the uſe of the ſtudents.

In order to make the hoſpital of ſtill further uſe to the ſtudents, Dr Monro frequently, while he continued profeſſor of anatomy, gave lectures on the chirurgical caſes; and the late judicious phyſician, Dr Rutherford profeſſor of the practice of phyſic, began, in the year 1748, to deliver clinical lectures to be continued every winter, on the moſt remarkable caſes in the hoſpital.

Doctor Monro, though he was elected profeſſor of anatomy in the year 1721, was not received into the univerſity till the year 1725, when he was inducted along with that great mathematician the late Mr Colin Maclaurin, with whom he ever lived in the ſtricteſt friendſhip. From this time he regularly every winter gave a courſe of lectures on anatomy and ſurgery, from October to May, upon a moſt judicious and comprehenſive plan: A taſk in which he perſevered with the greateſt aſſiduity, and without the leaſt interruption, for near 40 years; and ſo great was the reputation he had acquired, that ſtudents flocked to him from the moſt diſtant corners of his majeſty's dominions.

In 1759, our profeſſor entirely relinquiſhed the buſineſs of the anatomical theatre to his ſon Dr Alexander, who had returned from abroad, and had aſſiſted him in the courſe of lectures the preceding year. But after this reſignation, he ſtill endeavoured to render his labours uſeful to mankind, by reading clinical lectures at the hoſpital for the improvement of the ſtudents; of which Dr Duncan, who was one of his pupils, has given the following account. "There I had myſelf the happineſs of being a pupil, who profited by the judicious conduct of his practice, and was improved by the wiſdom and acuteneſs of his remarks. I have indeed to regret that I attended only the laſt courſe of lectures in which he had ever a ſhare, and at a time when he was ſubjected to a diſeaſe which proved at length fatal. Still, however, from what I ſaw and from what I heard, I can venture to aſſert, that it is hardly poſſible to conceive a phyſician more attentive to practice, or a preceptor more anxious to communicate inſtructions. His humanity, in the former of theſe characters, led him to beſtow the moſt anxious care on his patients while they were alive, and his zeal in the latter induced him to make them the ſubject of uſeful leſſons when they happened to die.—In the different ſtations of phyſician, of lecturer, and of manager in the hoſpital, he took every meaſure for inquiring into the cauſes of diſeaſes by diſſection.—He perſonally attended the opening of every body; and he not only dictated to the ſtudents an accurate report of the diſſection, but with nice diſcrimination contraſted the diſeaſed and ſound ſtate of every organ. Thus, in his own perſon, he afforded to the ſtudents a conſpicuous example of the advantages of early anatomical purſuits as the happieſt foundation for a medical ſuperſtructure. His being at once engaged in two departments, the anatomical theatre and clinical chair, furniſhed him with opportunities both on the dead and living body, and placed him in the moſt favourable ſituation for the improvement of medicine; and from theſe opportunities he derived every poſſible advantage which they could afford."

His father, old Mr Monro, lived to an advanced age; and enjoyed the unſpeakable pleaſure of beholding a ſon, eſteemed and regarded by mankind, the principal actor in the execution of his favourite plan, the great object of his life, the founding a ſeminary of medical education in his native country: The ſon, who ſurvived him near 30 years, had the ſatisfaction to behold this ſeminary of medical education frequented yearly by 300 or 400 ſtudents, many of whom came from the moſt diſtant corners of his majeſty's dominions, and to ſee it arrive to a degree of reputation far beyond his moſt ſanguine hopes, being equalled by few, and inferior to none, in Europe.

Few men were members of more ſocieties than Dr Monro: ſtill fewer equally aſſiduous in their attendance of thoſe which in any way tended to promote public utility. He was a manager of many public charities; and not only a member of different medical ſocieties, but likewiſe of ſeveral others inſtituted for promoting literature, arts, ſciences, and manufactures, in Scotland, and was one of their moſt uſeful members—While he was held in high eſtimation at home, he was equally eſteemed and reſpected abroad, and was elected member of the Royal Society of London, and an honorary member of the Royal Academy of Surgery at Paris.

He was not only very active in the line of his own profeſſion, but as a citizen and general member of the community; for, after he had reſigned the anatomical chair to his ſon, he executed with the ſtricteſt punctuality the duties of ſeveral engagements both of a civil and political nature: He was a director of the Bank of Scotland, a Juſtice of the Peace, a Commiſſioner of High-Roads, &c. At length, after a life ſpent in the moſt active induſtry, he became afflicted with a tedious and painful diſeaſe, which he bore with equal courage and reſignation till his death, which happened on July 10th, 1767, in the 70th year of his age.

Of his works, the firſt in order is his Oſteology, which was written for the uſe of ſtudents, but is capable alſo of affording inſtruction to the oldeſt and moſt experienced practitioner; as, beſides a minute deſcription of the parts copied from nature, it every where abounds with new and important obſervations immediately applicable to practice. It has been tranſlated into many different languages; has paſſed through numerous editions; and has been reprinted in foreign countries in the moſt ſuperb manner, accompanied with elegant and maſterly engravings. His deſcription of the Lacteal Sac and Thoracic Duct contains the moſt accurate account of that important part of the body which has been yet publiſhed: and his Anatomy of the Nerves will tranſmit to poſterity an excellent example of accurate diſſection, faithful deſcription, and ingenious reaſoning. The ſix volumes of Medical Eſſays and Obſervations, publiſhed by a ſociety in Edinburgh, are univerſally known and eſteemed. To that ſociety he was appointed ſecretary; but, after the publication of the firſt volume, to which he had largely contributed, the members growing remiſs in their attendance, he became the ſole collector and publiſher of the work: To him we are therefore in a great meaſure indebted for theſe numerous and important diſcoveries with which this publication has enriched every department of medical knowledge. In the two firſt volumes of the Phyſical and Literary Eſſays, publiſhed by the phyſical ſociety in Edinburgh, in which he had the rank of one of the preſidents, we find ſeveral papers written by him, which are not the leaſt ornaments of that collection. His account of the Succeſs of Inoculation in Scotland may be conſidered as his laſt publication: It demonſtrates his extenſive correſpondence and indefatigable induſtry, and has had great influence in promoting that ſalutary practice. Beſides theſe, he was alſo the the author of ſeveral other elegant and maſterly productions, which were either never publiſhed, or were publiſhed without his knowledge and from incorrect copies. A collection of all his works, properly, arranged, corrected, and illuſtrated with copperplates, has been publiſhed by Dr Alexander Monro, his ſon and ſucceſſor in the anatomical chair, in a ſplendid quarto volume, printed for Elliot, Edinburgh, 1781; to which is prefixed a life of the author, by another of his ſons, Dr Donald, phyſician in London, The obſervation of an excellent judge, the illuſtrious Haller concerning our author's Medical Eſſays and Obſervations, which now form a part of this collection, may with no leſs juſtice be applied to the whole: It is a "book which ought to be in the poſſeſſion of every medical practitioner."

MONS, an ancient, large, handſome, rich, and very ſtrong city of the Auſtrian Netherlands in Hainault. There is a chapter, conſiſting of 30 ladies of diſtinction, who have the liberty of leaving the community when they intend to marry. They have ſeveral manufactures, and a good trade. It was taken by the allies in 1709, and by the French in July 1746; but rendered back by the treaty of Aix-la-Chapelle, after the fortifications were demoliſhed. It ſtands partly on a hill, and partly on a plain in a marſhy ſoil, on the rivers Haine and Trouli, by which the country about it may be overflowed at pleaſure. It has been lately taken by the arms of the French Republic. E. Long. 3. 39. N. Lat. 50. 25.

Mons *Sacer*, (anc. geog.), a mountain of the Sabines beyond the Anio, to the eaſt of Rome; whither the common people retired once and again to avoid the tyranny of the patricians. From this ſeceſſion, and the altar of *Jupiter Terribilis* erected there, the mountain took its name.

MONSEIGNEUR, in the plural *Meſſeigneurs*, a title of honour and reſpect uſed by the French in writing to perſons of ſuperior rank or quality, before the late abolition of all ranks.

Dukes, peers, archbiſhops, biſhops, and preſidents *à la mortier*, were complimented with the title of *Monſeigneur*. In the petitions preſented to the ſovereign courts, they uſed the term *Meſſeigneurs*.

Monseigneur, abſolutely uſed, was a title reſtrained to the dauphin of France. This cuſtom was unknown till the time of Louis XIV. before which the dauphin was ſtyled *Monſieur le Dauphin*.

MONSIEUR, in the plural *Meſſieurs*, a term or title of civility, uſed by the French in ſpeaking to their equals, or thoſe a little below them, anſwering to *Mr* or *Sir* among the Engliſh.

Monsieur, abſolutely uſed, was a title or quality appropriated to the ſecond ſon of France, or the king's brother. The king was alſo called *Monſieur*, but that only by the children of France.

MONSON (Sir William), a brave Engliſh admiral, third ſon of Sir John Monſon of South Carlton in Lincolnſhire, was born in 1569. He was employed in many expeditions againſt the Spaniards in Queen Elizabeth's time, and was highly honoured; the queen knighted him for his ſervices in the earl of Eſſex's expedition to Cadiz, where he aſſiſted much by his wiſe and moderate counſel to the earl. Military men were no favourites with James I. therefore, on the death of the queen, he received no recompence or pay beyond the ordinary ſervice in which he was engaged: nevertheleſs, as admiral of the narrow ſeas, he ſupported the honour of the Britiſh flag againſt the infant inſolence of the Dutch ſtates, of which he frequently complains in his Navy tract; and protected the trade againſt the encroachments of France. He had the miſfortune to fall into diſgrace by his vigilance, and was impriſoned in the Tower through the reſentment of ſome powerful courtiers; yet he was diſcharged, and wrote a vindication of his own conduct, intitled, "Concerning the inſolencies of the Dutch, and a Juſtification of Sir William Monſon." He ſpent his latter days in peace and privacy, which he employed in digeſting his Navy Tracts, and died in 1643.— Part of theſe tracts were printed in 1682; and they were afterwards all included in Churchill's Collection of Voyages.

MONSONIA, in botany: A genus of the dodecandria order, belonging to the polyadelphia claſs of plants. The calyx is pentaphyllous; the corolla pentapetalous and irregular; the ſtamina are 15 in number, and coalited into five filaments; the ſtyle bifid; the capſule pentacoccous.

MONSOON, a regular or periodical wind, in the Eaſt Indies, blowing conſtantly the ſame way, during ſix months of the year, and the contrary way the remaining ſix.

In the Indian ocean, the winds are partly general, and blow all the year round the ſame way, as in the Ethiopic ocean; and partly periodical, *i. e.* half the year blow one way, and the other half year on the oppoſite points: and thoſe points and times of ſhifting differ in different parts of this ocean. Theſe latter are what we call *monſoons*.

The ſhifting of theſe monſoons is not all at once; and in ſome places the time of the change is attended with calms, in others with variable winds, and particularly thoſe of China, at ceaſing to be weſterly, are very ſubject to be tempeſtuous; and ſuch is their violence, that they ſeem to be of the nature of the Weſt India hurricanes, and render the navigation of thoſe ſeas very unſafe at that time of the year. Theſe tempeſts the ſeamen call the *breaking up of the monſoons*.

Monſoons, then, are a ſpecies of what we otherwiſe call *trade-winds*. They take the denomination *monſoon* from an ancient pilot, who firſt croſſed the Indian ſea by means hereof. Though others derive the name from a Portugueſe word, ſignifying motion or change of wind, and ſea.

Lucretius and Apollonius make mention of annual winds which ariſe every year, *eteſia flabria*, which ſeem to be the ſame with what in the Eaſt Indies we now call *monſoons*. For the phyſical cauſe of theſe winds, ſee Wind.

MONSTER; a birth or production of a living being, degenerating from the proper and uſual diſpoſition of parts in the ſpecies to which it belongs: As, when there are too many members, or too few; or ſome of them are extravagantly out of proportion, either on the ſide of defect or exceſs. The word comes from the Latin *monſtrum*, of *monſtrando*, "ſhowing." Whence alſo the box wherein relics were anciently kept to be ſhown, was called *monſtrum*. Dugdale mentions an inventory of the church of York with this article, *Item unum monſtrum cum oſſibus ſancti Petri in Beryl, & crucifixo in ſummitate*.

Ariſtotle defines a monſter to be a defect of nature, when, acting towards ſome end, it cannot attend to it, from ſome of its principles being corrupted.

Monſters do not propagate their kind; for which reaſon ſome rank *mules* among the number of monſters, as alſo *hermaphrodites*.

Females which bring forth twins, are found moſt liable to produce monſters. The reaſon, probably, is owing to this; that though the twins are covered with one common chorion, yet they have each their ſeparate amnios, which by their contiguity may chance to grow together, and ſo occaſion a confuſion or blending of the parts. Hence ſo many double creatures.

F. Malebranche accounts for the production of monſters in the animul world in the following manner: "The Creator has eſtabliſhed ſuch a communication between the ſeveral parts of his creation, that we are not only naturally led to imitate one another, *i. e.* have a diſpoſition to do the ſame things and aſſume the ſame manner, with thoſe with whom we converſe; but alſo have certain natural diſpoſitions which incline us to compaſſion as well as imitation. Theſe things moſt men feel, and are ſenſible of; and therefore need not be proved. The animal ſpirits, then, are not only naturally carried into the reſpective parts of the body to perform the ſame actions and the ſame motions which we ſee others do, but alſo to receive in ſome manner their wounds, and take part in their ſufferings.

"Experience tells us, that when we look attentively on any perſon ſeverely beaten, or that hath a large wound, ulcer, or the like, the ſpirits immediately flow into thoſe parts of our body which anſwer to thoſe we ſee ſuffer in the other; unleſs their courſe be ſtopped from ſome other principle. This flux of ſpirits is very ſenſible in perſons of a delicate conſtitution, who frequently ſhudder, and find a kind of trembling in the body on theſe occaſions; and this ſympathy in bodies produces compaſſion in the mind.

"Now it muſt be obſerved, that the view of a wound, &c. wounds the perſon who views it the more ſtrongly and ſenſibly, as the perſon is more weak and delicate; the ſpirits making a ſtronger impreſſion on the fibres of a delicate body than in thoſe of a robuſt one. Thus ſtrong, vigorous men, &c. ſee an execution without much concern, while women, &c. are ſtruck with pity and horror. As to children ſtill in their mother's womb, the fibres of their fleſh being incomparably finer than thoſe in women, the courſe of the animal ſpirits muſt neceſſarily produce much greater alterations.

"Theſe things being laid down, monſters are eaſily accounted for. Suppoſe, *v. gr.* a child born a fool, and with all its legs and arms broke in the ſame manner as thoſe of criminals in ſome countries are; which caſe we chooſe to inſtance in, becauſe we are told from Paris that ſuch a monſter was actually born there, and lived in one of their hoſpitals 20 years: the cauſe of this accident, according to the principles laid down, was, that the mother ſeeing a criminal executed, every ſtroke given to the poor man, ſtruck forcibly the imagination of the woman; and, by a kind of counterſtroke, the tender and delicate brain of the child.—Now, though the fibres of the woman's brain were ſtrangely ſhaken by the violent flux of animal-ſpirits on this occaſion, yet they had ſtrength and conſiſtence enough to prevent an entire diſorder; whereas the fibres of the child's brain being unable to bear the ſhock of thoſe ſpirits, were quite ruined, and the ravage was great enough to deprive him of reaſon all his lifetime.

"Again, the view of the execution frighting the woman, the violent courſe of the animal ſpirits was directed forcibly from the brain to all thoſe parts of the body correſponding to the ſuffering parts of the criminal; and the ſame thing muſt happen in the child. But in regard the bones of the mother were ſtrong enough to reſiſt the impulſe of thoſe ſpirits, they were not damaged: and yet the rapid courſe of theſe ſpirits could eaſily overpower and break the tender and delicate fibres of the bones of the child; the bones being the laſt parts of the body that are formed, and having a very ſlender conſiſtence while the child is yet in the womb.

"To which it may be here added, that had the mother determined the courſe of theſe ſpirits towards ſome other part of her body, by tickling or ſcratching herſelf vehemently, the child would not in all probability have had its bones broken; but the part anſwering that to which the motion of the ſpirits was determined, would have been the ſufferer. Hence appears the reaſon why women in the time of geſtation, ſeeing perſons, &c. marked in ſuch a manner in the face, impreſs the ſame mark on the ſame parts of the child: and why, upon rubbing ſome hidden part of the body when ſtartled at the ſight of any thing or agitated with any extraordinary paſſion, the mark or impreſſion is fixed on that hidden part rather than on the face of the child. From the principles here laid down, may moſt, if not all, the phenomena of monſters be eaſily accounted for."

Various other theories have been formed by different philoſophers and phyſiologiſts. But after all, it muſt be confeſſed, that we ſeem as yet to be very little acquainted with Nature in her ſports and errors. For each organiſed being there appears to exiſt a primitive germ or model of the different ſpecies drawn by the Creator, determined by forms and ſexes, and realiſed in the individuals of both ſexes, which muſt unite in order to their reproduction. From this model nature never departs, unleſs when compelled by circumſtances which derange the primitive organization common to the ſpecies, and produce what we call *monſters*.

With reſpect to ſtructure, we have already remarked, that monſters are of various kinds. Some have an exceſs or defect in certain parts; ſuch as thoſe which are called *acephalous*, or who want the head; thoſe which have two heads, two arms, two legs, and one body, or which have two bodies and one head, or which have three legs; and thoſe which want the arms or the legs. Others err through an extraordinary and deformed conformation, through an unnatural union of certain parts or viſcera, through a great derangement in one or more of their members, and through the extraordinary place which theſe often occupy in conſequence of this derangement or tranſpoſition. The monſter deſcribed by Dr Eller of the academy of Berlin was of this kind. It was a fœtus of nine months, 28 inches long, with an enormous head and frightful countenance; and in the middle of a broad and vaſt forehead it had a reddiſh eye, without either eyebrows or eyelids, and ſunk deep into a ſquare hole. Immediately below this eye was an excreſcence which ſtrongly reſembled a penis with a glans, a prepuce, and an urethra: the part covered with hair was likewiſe below the nape of the neck. In other monſters we meet with the unnatural union of ſome parts, which, from their deſtination and functions, ought always to be ſeparate; and the ſeparation of other parts, which, for the ſame reaſons, ought conſtantly to be united. The reader may ſee the different ways in which the formation of monſters takes place in four memoirs by M. Lemery, inſerted in *L'Hiſtoire de l'Academie des Sciences*, 1738 and 1739. M. du Verney has likewiſe publiſhed a Memoir on the ſame ſubject.

In the volume publiſhed by the Academy of Sciences in 1724, mention is made by M. Geoffroy of a monſter born in Barrois 1722. This monſtrous production conſiſted of two children without the inferior extremities, joined together by a common navel: each of them had a nurſe, ſucked, and eat pap; and the one ſucked while the other ſlept. The reader may likewiſe conſult the ſecond part of Winſlow's Memoirs on Monſters, inſerted in the volume publiſhed by the Academy of Sciences in 1734. where he will find the hiſtory of two very extraordinary twin monſters, who evidenced during their life a great difference in their moral and phyſical qualities. We are obliged ſimply to refer to thoſe Memoirs, as they are too long for abridgement.

It is obſerved by Haller, that in ſome monſters the natural ſtructure is changed by ſome ſhock or paſſion: in others the ſtructure, independent of any accident, is originally monſtrous; ſuch as when all the members are reverſed from left to right, when the perſon has ſix fingers, and in many other inſtances, M. de Maupertius mentions, that there is at Berlin a family who have had ſix fingers on each hand for ſeveral generations. M. de Riville ſaw an inſtance of this at Malta, of which he has given a deſcription. M. Renou, ſurgeon at Pommeraye in Anjou, has publiſhed an account of ſome families with ſix fingers, which are to be found in ſeveral pariſhes of the Lower Anjou, and which have exiſted there for time immemorial. This deformity is perpetuated in theſe families even when they intermarry with perſons who are free from it. Whether the propagation of theſe ſupernumerary organs, which are not only uſeleſs but inconvenient and even diſagreeable, be owing to the father or mother, their children of both ſexes are ſubject to it indiſcriminately. A father or mother with ſix fingers frequently have a part, and ſometimes the whole, of their children, free from this deformity; but it again makes its appearance, and in a very great degree, in the third generation. From this it appears, that this fault in the conformation is hereditary. M. Reaumur has likewiſe publiſhed the hiſtory of a family in the iſland of Malta, the children of which are born with ſix fingers and ſix toes. But it deſerves to be inquired, Whether theſe ſupernumerary fingers are real fingers? The reader may here conſult the *Journal de Phyſique* for November 1774, p. 372. This variety of *ſexdigitary* hands and feet is not comprehended in the *Recherches ſur quelques confirmations monſtrueuſes des doigts dans l'homme*, which is inſerted in the Memoirs of the Academy of Sciences for 1771. In the *Journal de Phyſique* for Auguſt 1776, we find a deſcription of a double uterus and vagina obſerved in a woman who died in childbed, by Dr Purcell of Dublin: and in that for June 1788, we have an account of a man with ſeven fingers on each hand, by Baron Dietricht.

Several monſtrous productions are to be ſeen in the cabinet at Chantilly. 1. Two calves joined together in the body, with each a ſeparate head and neck, and four legs in whole. 2. Two calves united only by the pelvis, with only one anus and one tail: the whole is ſupported by ſix legs, four before and two behind. 3. A lamb with ſix legs, four of which are behind. 4. The ſkeleton of a ram, which has likewiſe ſix legs. 5. A hermaphrodite deer. 6. The head of a foal which has only one eye in the middle of the forehead. 7. Some leverets with ſix and eight legs. 8. A puppy, the lips of which are divided fourfold. 9. Some fœtuſes of a hog which have a kind of tube upon their forehead one or two inches long; and another, the hinder part of which is double in every thing. 10. Two double human fœtuſes joined by the belly, with four arms and three legs. 11. A young chicken with two bodies and one head. 12. A pigeon and a duck, each with two bills. 13. A duck with two heads. 14. A pigeon with four feet. 15. A capon with three feet; the third being fixed to the anus. 16. Two heads of a calf joined together, each of them with two ears: theſe two heads were both fixed to one neck. 17. In the *Menagerie* at Chantilly there was formerly to be ſeen a cow with five feet, the fifth of which was connected with the dug. 18. A rabbit without ears. 19. Two cats, each having two heads. 20. Two leverets newly brought forth, well ſhaped in the body and legs, but connected together by means of only one head. 21. Several eggs, in the figure of which there occur ſome monſtrous appearances and extraordinary deformities, ſufficient to ſhow that they are contrary to the eſtabliſhed form of nature.

Everhard Hume, Eſq; F. R. S. ſome time ago preſented to John Hunter, Eſq; F. R. S. the *double ſkull* of a child, born at Calcutta in May 1783, of poor parents aged 30 and 35, and which lived to be nearly two years old. The body of this child was naturally formed: but the head had the phenomenon of appearing double; another head of the ſame ſize, and almoſt equally perfect, being attached to its upper part. In this extraneous and preternatural head no pulſation could be felt in the arteries of the temples, but the ſuperficial veins were very evident; one of the eyes had been hurt by the fire, upon which the midwife, in her firſt alarm, threw the child: the other moved readily; but the iris was not affected by the approach of any thing to it. The external ears of this head were very imperfect; the tongue adhered to the lower jaw, except for about half an inch at the lip, which was looſe: the jaw was capable of motion, but there were no teeth. The child was ſhown about the ſtreets of Calcutta for a curioſity; but was rendered unhealthy by confinement, and died at laſt of a bite of the *cobra de capello*. It was dug up by the Eaſt India Company's agent for ſalt at Tumlock, and the ſkull is now in the muſeum of Mr Hunter.

Among the monſtrous productions of the animal kingdom, we may rank thoſe individuals which ought only to poſſeſs one ſex, but in which we obſerve the union or the appearance of two. See the articles ANDROGYNES and HERMAPHRODITE.

M. Fabri arranges mutilations of the members, diſtortions, gibboſities, tumors, diviſions of the lips or of the palate, compreſſions of the cranium, and many other deformities of this kind, in the claſs of *morbific* monſtruoſities. In that which he calls *connatural* (*connaturelle*) monſtruoſities, are placed the plurality, tranſpoſition, and inſertion of the parts. To explain theſe facts, a great many writers have had recourſe to the effect of the imagination of pregnant women.—The cauſes of the firſt claſs of monſtruoſities are diſcuſſed by M. Fabri, who obſerves that ſome of them are *internal* with regard to the mother, and others *exter-*

nal. By an *internal cauſe*, he here means all thoſe depravations or morbific principles which can affect the fluids, and which vitiate the form and ſtructure of the ſolids; in particular the uterus, in which ſuch depravations have often been found to occur. To theſe he adds violent affections of the mind, ſpaſmodic contractions, hyſteric convulſions, and the many inconveniences of this kind to which women are extremely ſubject. External cauſes comprehend every thing which can act externally upon the fœtus contained in the uterus, ſuch as the preſſure of the clothes; and in ſhort every thing which prevents the free dilatation of the belly in women who are pregnant, violent motions, falls, blows, and all accidents of this kind. Theſe external cauſes, and eſpecially the firſt, compreſs the fœtus in the womb, and oblige it to remain in a very confined ſituation. This, according to the obſervation of Hippocrates, produces thoſe embryos which are born with ſome entire part wounded. M. Fabri maintains, that all deformities of the fœtus proceed from mechanical and accidental cauſes.

The name of *monſters* is likewiſe given to animals enormous for bulk; ſuch as the elephant among terreſtrial quadrupeds, and the ſhark and the whale among ſea animals; to other animals remarkable for fierceneſs and cruelty; and to animals of an extraordinary ſpecies, which, we are told, ariſes from the copulation of one animal with another of a different genus. According to the report of travellers, Africa abounds with monſters of this kind; and accounts of the Eaſt are full of deſcriptions a ſea monſters, which, however, are ſeldom to be ſeen, ſuch as *ſeamen*, *mermaids* &c.

Monſters are more common and more extraordinary in the vegetable than in the animal kingdom, becauſe the different juices are more eaſily deranged and confounded together. Leaves are often ſeen, from the internal part of which other leaves ſpring forth: and it is not uncommon to ſee flowers of the ranunculus, from the middle of which iſſues a ſtalk bearing another flower. M. Bonnet informs us, that in certain warm and rainy years he has frequently met with monſters of this kind in roſe-trees. This obſerver ſaw a roſe, from the centre of which iſſued a ſquare ſtalk of a whitiſh colour, tender, and without prickles, which at its top bore two flower-buds oppoſite to each other, and totally deſtitute of a calyx; a little above the buds iſſued a petal of a very irregular ſhape. Upon the prickly ſtalk which ſupported the roſe, a leaf was obſerved which had the ſhape of trefoil, together with a broad flat pedicle. In the memors of the Academy of ſciences for 1707, p. 448, mention is made of a roſe, from the centre of the leaves of which iſſued a roſe-branch two or three inches long, and furniſhed with leaves. See the ſame Memoirs for 1749, p. 44, and for 1724, p. 20. In the Memoirs for 1775, a very ſingular inſtance is mentioned of a monſtruoſity obſerved by M. Duhamel, in an apple-tree ingrafted with clay. At the place of the inſertion, there appeared a bud which produced a ſtalk and ſome leaves; the ſtalk and the pedicle of the leaves were of a pulpy ſubſtance, and had the moſt perfect reſemblance both in taſte and ſmell to the pulp of a green apple. An extraordinary *chamæmelum* is mentioned in the *Acta Helvetica*. M. Bonnet, in his *Recherches ſur l'uſage des feuilles*, mentions likewiſe ſome monſtrous productions which have been found in fruits with kernels, analagous in their nature to thoſe which occur in the flowers of the ranunculus and of the roſe-tree. He has ſeen a pear, from the eye of which iſſued a tuft of 13 or 14 leaves, very well ſhaped and many of them of the natural ſize. He has ſeen another pear which gave riſe to a ligneous and knotty ſtalk, on which grew another pear ſomewhat larger than the firſt.—The ſtalk had probably flouriſhed, and the fruit had formed. The *lilium album polyanthos*, obſerved ſome years ago at Breſlau, which bore on its top a bundle of flowers, conſiſting of 102 lilies, all of the common ſhape, is well known. M. Reynier has mentioned ſome individuals monſtrous with reſpect to the flower, in the *Journal de Phyſique et d'Hiſtoire Naturelle*, for November 1785. He has likewiſe mentioned a monſtrous tulip which is ſeen in the gardens of ſome amateurs; juniper berries with horns; a balſamic with three ſpurs, &c.

Theſe vegetable productions, which are ſo extraordinary, and ſo contrary to the common courſe of things, do nevertheleſs preſent deviations ſubject to particular laws, and reducible to certain principles, by diſtinguiſhing ſuch as are perpetuated either by ſeed or by tranſplanting, from thoſe which are only accidental and paſſing. Monſtruoſities which are perpetuated exiſt in the original organization of the ſeed of the plant, ſuch as marked or curled leaves, &c. The word *monſter* is more properly applied to thoſe irregularities in plants which ariſe from frequent tranſplantation, and from a particular culture, ſuch as double flowers, &c. but thoſe monſtruoſities which are not perpetuated, and which ariſe from accidental and tranſient cauſes deranging the primitive organization of the plant, when it comes to be unfolded, as is the effect of diſeaſes, of heat or cold, of a ſuperfluity or ſcarcity of juices, of a depravation of the veſſels contributing to nutrition, of the ſting of inſects, of contuſions and natural graffs, retain alſo the name of *monſters*. Of this kind are knobs or ſwellings, ſtunting, gall-nuts, certain ſtreaks, and other ſimilar defects. All the parts of plants are ſubject to ſome of theſe monſtruoſities, which very with reſpect to their ſituation, figure, proportion, and number. Some trees are naturally of ſo great a ſize, that they may be conſidered as a kind of whale ſpecies in the vegetable kingdom: of this kind are the baobab and the ceiba. Others, as the oak, the yew, the willow, the lime, and many others, ſometimes though rarely, attain ſo extraordinary a bulk that they are likewiſe monſters among the vegetables. It is conjectured, in ſhort that monſters are more common in the vegetable than in the animal kingdom, becauſe in the latter the methods of propagation are not ſo numerous. Plants are ſeldom monſtrous in all their parts; ſome are monſtrous only through exceſs in the calyx and corolla; others are ſo through defect only in the leaves, ſtamina, and fruit. Now, a monſtruoſity, ſays M. Adanſon, has never changed the name or affected the immutability of a ſpecies. Every ſkilful ſucceeding botaniſt has arranged theſe monſtruoſities in plants among accidental circumſtances, which in whatever manner they are propagated, have always a tendency to revert to the order and regularity of their original ſpecies when they are multiplied by means of ſeed; which method of reproduction is the moſt natural and the moſt certain for determining the ſpecies. One ſpecies may be compared with another; but a monſter can only be put in compariſon with an individual of the ſpecies from which it comes. The reader may conſult the *Obſervations Botaniques* of M. Schlotterbec, of the Society of Baſil, concerning monſters in plants, wherein he pretends to demonſtrate, that in their production nature follows the ſame courſe in the vegetable as in the animal kingdom.

MONT-ALBAN, a ſtrong town of Spain, in the kingdom of Arragon, with a ſtrong citadel; ſeated on the river Riomartin, 44 miles ſouth of Saragoſſa, and 92 north by weſt of Valencia. W. Long. 0. 30. N. Lat. 41. 9.

Mont-didier, an ancient town of France in Picardy, where the kings of France formerly had a palace and kept their court. It is ſeated on a mountain, 17 miles from Amiens and Compeigne, and 58 north of Paris. W. Long. 2. 34. N. Lat. 49. 39.

Mont-Lheri, a town of the iſle of France, 15 miles from paris. Here are the remains of a tower, which may be ſeen at great diſtance. E. Long. 2. 0. N. Lat. 48. 38.

Mont-Louis, a ſmall but ſtrong town of France, in the Pyrenees, with a ſtrong citadel; ſeated on an eminence, 430 miles ſouth of Paris. E. Long. 2. 5. N. Lat. 42. 30.

Mont-Luel, a town of France in Breſſe, and capital of the territory of Valbonne; ſeated in a fertile pleaſant country on the river Seraine, eight miles from Lyons, and 205 ſouth-eaſt of Paris. E. Long. 5. 8. N. Lat. 45. 49.

Mont-Luzon, a town of France in Bourbonnois; ſeated on the river Cher, 35 miles ſouth-weſt of Moulins, and 150 ſouth of Paris. E. Long. 2. 45. N. Lat. 46. 22.

Mont-Blanc. See *Mont-Blanc*.

MONTABOUR, a ſmall fortified town of Germany, in the electorate of Treves, between Coblentz and Limpurg. E. Lon. 7. 50. N. Lat. 50. 30.

MONTAGNIAC, a conſiderable town of Aſia, in Natolia, and in the province of Bec-Sangel, on the ſea of Marmora. It carries on a great trade, eſpecially in fruits, and is ſeated on a bay of the ſame name, 12 miles from Burſa, and 60 ſouth-eaſt of Conſtantinople. E. Long. 29. 40. N. Lat. 40. 20.

MONTAGUE (Edward), earl of Sandwich, an illuſtrious Engliſhman, who ſhone from the age of 19, and united the qualifications of general, admiral, and ſtateſmen; yet there were ſtrange inconſiſtencies in his character. He acted early againſt Charles I; he perſuaded Cromwell, whom it is ſaid he admired, to take the crown; and he was zealous for the reſtoration of Charles II. All this is imputed to a fond and unaccountable paſſion which he had for royalty. Upon general Monk's coming into England, he ſailed with the fleet to Holland, and ſoon after he had the honour to convey his majeſty to England. For this he was created knight of the garter; and on the 12th of July 1660 he was created baron Montague of St Neot's in the county of Huntingdon, Viſcount Hinchinbrooke in the ſame county, and earl of Sandwich in Kent, ſworn one of his majeſty's moſt honourable privy-council, made maſter of the king's wardrobe, admiral of the Narrow Seas, and lieutenant-admiral to the duke of York, as lord high admiral of England.

When the Dutch war broke out in 1694, and the duke of York took upon himſelf the command of a fleet as high-admiral, his lordſhip commanded the blue ſquadron, and by his induſtry and care abundance of the enemies ſhips were taken; and in the great battle fought on the third of June 1665, in which the Dutch loſt admiral Opdam, and had 18 men of war taken and 14 deſtroyed, a large ſhare of the honour of the victory was juſtly given to the conduct of the earl of Sandwich. On the return of the Engliſh navy, the command of the whole fleet was given to the earl of Sandwich, which he was ordered to put as ſpeedily as poſſible in a condition to return to the coaſt of Holland. Accordingly the earl ſailed on the 5th of July with 60 men of war to the Dutch coaſt; when finding that their Eaſt India and Smyrna fleets were to return home north about, he ſteered for the coaſt of Norway, and found they had taken ſhelter in the port of Bergen, where the fleet were attacked: but leaving them there, and ſailing back towards the coaſt of Holland, he met with four Dutch Eaſt Indiamen, with ſeveral other merchant ſhips, under a good convoy, and took eight men of war, two of their Eaſt India ſhips, and 20 ſail of merchant-men; and a few days after, a part of the fleet falling in with 18 of the Hollanders, the greateſt part of them were alſo taken, with four Dutch men of war, and above 1000 priſoners. On his return he was received by the king with diſtinguiſhed marks of favour; and ſoon after, he was ſent ambaſſador extraordinary to the court of Madrid, to mediate a peace between the crowns of Spain and Portugal; when he had the happineſs to conclude a peace between the two nations to their mutual ſatisfaction.

On the breaking out of the laſt Dutch war, his lordſhip went to ſea with the duke of York, and commanded the blue ſquadron; the French admiral, count d'Eſtrees, commanding the white. The fleet was at ſea in the beginning of the month of May; and coming to an anchor in Southwold-bay in order to take in water, we are told, that on the 27th many officers and ſeamen were permitted to go on ſhore, and were at Southwold, Dunwich, and Aldborough; when, the weather being hazy, the earl gave it as his opinion, that, the wind ſtanding as it did, the fleet rode in danger of being ſurpriſed by the Dutch; and indeed, between two and three the next morning, they were informed of their approach, upon which his royal highneſs made the ſignal for weighing anchor. The blue ſquadron was out firſt, the red next, and the white was much aſtern. The earl of Sandwich in the Royal James, which carried 100 guns, began the fight, and fell furiouſly on the ſquadron of Van Ghent in order to give the reſt of his fleet time to form; when captain Brakel, in the Great Holland, attacked the Royal James but was ſoon diſabled, as were ſeveral other men of war, and three fire ſhips ſunk. By this time moſt of his men were killed; and the hull of the Royal James, was ſo pierced with ſhot, that it was impoſſible to carry her off. In this diſtreſs he might have been relieved by his vice-admiral Sir Joſeph Jordan, had not that gentlemen been more ſolicitous about aſſiſting the duke. When therefore he ſaw him ſail by, heedleſs of the condition in which he lay, he ſaid to thoſe who were about him, "There is nothing left for us now, but to defend the ſhip to the laſt man." Being at length grappled by a fourth fire-ſhip, he begged his captain Sir Richard Haddock, and all his ſervants, to get into the boat and ſave themſelves, which they did: yet ſome of the ſailors refuſed to quit the admiral, and ſtaying endeavoured to extinguiſh the fire, but in vain; the ſhip blew up about noon. His lordſhip's body was found about a fortnight after, and was interred with great ſtate in Henry VII.'s chapel.—We have of his lordſhip's writing, 1. The Art of Metals, in which is declared the manner of their generation, tranſlated from the Spaniſh of Albaro Alonzo Barba, 8vo. 2. Several letters during his embaſſy to Spain, publiſhed with Arlington's letters. 3. A letter to ſecretary Thurloe. 4. Original letters and negociations of Sir Richard Fanſhaw, the earl of Sandwich, the earl of Sunderland, and Sir William Godolphin, wherein divers matters between the three crowns of England, Spain, and Portugal, from the year 1663 to 1678, are ſet in a clear light, 2 vols. 8vo.

Montague (Charles), earl of Halifax, fourth ſon of George Montague of Harton in Northamptonſhire, Eſq; ſon of Henry the firſt earl of Mancheſter, was born in 1661. He was educated at Weſtminſter-ſchool and Cambridge, ſhowed very early a moſt pregnant genius, and quickly made great progreſs in learning. In 1684, he wrote a poem on the death of King Charles II. in which he diſplayed his genius to ſuch advantage, that he was invited to London by the earl of Dorſet: and upon his coming thither he ſoon increaſed his fame, particularly by a piece which he wrote in conjunction with Prior, publiſhed at London in 1687, under the title of, "The Hind and the Panther tranſverſed to the Story of the Country-mouſe and the City-mouſe." Upon the abdication of King James II. he was choſen one of the members of the convention, and recommended by the earl of Dorſet to King William, who immediately allowed him a penſion of 500 l. *per annum.* Having given proofs of his great abilities in the houſe of commons, he was made one of the commiſſioners of the treaſury, and ſoon after chancellor of the exchequer: in which poſt he brought about that great work of re-coining all the current money of the nation. In 1698, he was appointed firſt commiſſioner of the treaſury; and in 1699 was created a peer of England, by the title of *Baron Halifax* in the county of York. In 1701, the houſe of commons impeached him of ſix articles, which were diſmiſſed by the houſe of Lords. He was attacked again by the houſe of commons in 1702, but without ſucceſs. In 1705, he wrote, An Anſwer to Mr Bromley's Speech in relation to the occaſional Conformity-bill. In 1706, he was one of the commiſſioners for the Union with Scotland; and upon paſſing the bill for the naturalization of the illuſtrious houſe of Hanover, and for the better ſecurity of the ſucceſſion of the crown in the Proteſtant line, he was made choice of to carry that act to Hanover. Upon the death of Queen Anne, when the king had taken poſſeſſion of his throne, his lordſhip was appointed firſt commiſſioner of the treaſury, and created earl of Halifax and knight of the garter. He died in 1715. His lordſhip wrote ſeveral other pieces beſides thoſe abovementioned; all which, with ſome of his ſpeeches, were publiſhed together in 1716 in an octavo volume.

Montague (Lady Mary Wortley) accompanied her huſband who was ſent on an embaſſy to Conſtantinople in the beginning of this century. On her return ſhe introduced the practice of inoculation into England, and thence acquired great celebrity. She cultivated the belles lettres; and at one period of her life ſhe was the friend of Pope, and at another his enemy. While they were at enmity with each other, Lady Mary Montague embraced every opportunity of defaming the poet, who well knew how to take revenge. Both of them carried their animoſity to ſo great a height, that they became the ſubject of public converſation. After a long life, full of ſingular and romantic adventures, ſhe died about the year 1760. From her we have *Letters*, written during her travels from the year 1716 to the year 1718. They have been tranſlated into French, and publiſhed at Rotterdam 1764, and at Paris 1783, one vol. 12 mo. They are compoſed in a lively, intereſting, and agreeable ſtyle, and contain many curious facts relating to the manners and government of the Turks, which are no where elſe to be found. The Baron de Tott, who lived many years at Conſtantinople, attacked them with great ſeverity; but they have been defended with equal zeal by M. Guis of Marſeilles, who has publiſhed a valuable work on Turkey. It need not appear extraordinary, that perſons who have viſited the ſame country ſhould not ſee things in the ſame light. How few travellers agree in their accounts of the ſame objects, which they nevertheleſs pretend to have ſeen and to have examined with attention.

Montague (Edward Wortley), ſon of the former, paſſed through ſuch variegated ſcenes, that a bare recital of them would ſavour of the marvellous. From Weſtminſter-ſchool, where he was placed for education, he ran away three ſeveral times. He exchanged clothes with a chimney-ſweeper, and followed for ſome time that ſooty occupation. He next joined himſelf to a fiſherman, and cried flounders in Rotherhithe. He then ſailed as a cabin-boy to Spain; where he had no ſooner arrived, than he ran away from the veſſel, and hired himſelf to a driver of mules. After thus vagabondiſing it for ſome time, he was diſcovered by the conſul, who returned him to his friends in England. They received him with a joy equal to that of the father of the prodigal ſon in the goſpel. A private tutor was employed to recover thoſe rudiments of learning which a life of diſſipation, of blackguardiſm, and of vulgarity, might have obliterated. Wortley was ſent to the Weſt Indies, where he remained ſome time; then returned to England, acted according to the dignity of his birth, was choſen a member, and ſerved in two ſucceſſive parliaments. His expences exceeding his income, he became involved in debt, quitted his native country, and commenced that wandering traveller he continued to the time of his death. Having viſited moſt of the eaſtern countries, he contracted a partiality for their manners. He drank little wine; a great deal of coffee; wore a long beard; ſmoked much;

and, even whilſt at Venice, he was habited in the eaſtern ſtyle. He ſat croſs-legged in the Turkiſh faſhion through choice. With the Hebrew, the Arabic, the Chaldaic, and the Perſian languages, he was as well acquainted as with his native tongue. He publiſhed ſeveral pieces. One on the "Riſe and Fall of the Roman Empire." Another an Exploration of "The Cauſes of Earthquakes." As this gentleman was remarkable for the uncommon incidents which attended his life, the cloſe of that life was no leſs marked with ſingularity. He had been early married to a woman who aſpired to no higher a character than that of an induſtrious waſherwoman. As the marriage was ſolemnized in a frolic, Wortley never deemed her ſufficiently the wife of his boſom to cohabit with her. She was allowed a maintenance. She lived contented, and was too ſubmiſſive to be troubleſome on account of the conjugal rites. Mr Montague, on the other hand, was a perfect patriarch in his manners. He had wives of almoſt every nation. When he was with Ali Bey in Egypt, he had his houſehold of Egyptian females, each ſtriving who ſhould be the happy ſhe who could gain the greateſt aſcendency over this Anglo-Eaſtern-baſhaw. At Conſtantinople, the Grecian women had charms to captivate this unſettled wanderer. In Spain, a Spaniſh brunette, in Italy the olive complexioned female were ſolicited to partake the honours of the bridal-bed. It may be aſked what became of this group of wives? Mr Montague was continually ſhifting the place, and conſequently varying the ſcene. Did he travel with his wives as the patriarchs did with their flocks and herds? No ſuch thing. Wortley, conſidering his wives as bad travelling companions, generally left them behind him. It happened, however, that news reached his ears of the death of the original Mrs Montague the waſherwoman. Wortley had no iſſue by her; and without iſſue male, a very large eſtate would revert to the ſecond ſon of Lord Bute. Wortley, owing the family no obligations, was determined, if poſſible, to defeat their expectations. He reſolved to return to England and marry. He acquainted a friend with his intentions; and he commiſſioned that friend to advertiſe for any young decent woman who might be in a pregnant ſtate. Several ladies anſwered it. One out of the number was ſelected, as being the moſt eligible object. She waited with eagerneſs for the arrival of her expected bridegroom; but, behold, whilſt he was on his journey, death very impertinently arreſted him in his career.

Montague-Iſland, one of the Hebrides, in the South Sea, near Sandwich Iſland. E. Long. 168. 37. S. Lat. 17. 26.

MONTAIGNE (Michel de) a French gentleman, was born in Perigord in 1533. His father educated him with great care, and made him learn Latin as other children learn their mother-tongue, His tutors were Nicholas Gronchi, who wrote *De Comitiis Romanorum;* William Guerenti, who wrote on Ariſtotle; George Buchanan; and M. Anthony Muret. He was alſo taught Greek by way of recreation; and becauſe ſome think that ſtarting children out of their ſleep ſpoils their underſtanding, he was awakened every morning with the ſound of muſic. He was counſellor for a while in the parliament of Bourdeaux; afterwards made mayor of Bourdeaux. He publiſhed his *Eſſays*, ſo much known in the world, in 1580. Montaigne had a great deal of wit and ſubtlety, but no ſmall ſhare of conceit and vanity. The learned and ingenious are much divided in their opinion about his works. He died in 1592.

MONTALCINO, a ſmall populous town of Italy, in Tuſcany, and in the territory of Sienna, with a biſhop's ſee. It is ſeated on a mountain, 17 miles ſouth-eaſt of Sienna, and 44 ſouth eaſt of Florence. E. Long. 11. 30. N. Lat. 43. 7.

MONTALTO, an epiſcopal town of Italy, in the Marca of Ancona; ſeated on the river Monacio, 10 miles north of Aſcolii, and 45 ſouth of Anconia. E. Long. 13. 30. N. Lat. 42. 54.

MONTANINI (Pietro), called *Petruccio Perugino*, an eminent landſcape painter, was born at Perugia in 1619. At firſt he was inſtructed by his uncle Pietro Barſotti; but was afterwards placed as a diſciple with Ciro Ferri. Yet he did not long adhere to the manner of either of thoſe maſters, chooſing preferably to ſtudy under Salvator Roſa; and he imitated the ſtyle of that celebrated painter with exceeding great ſucceſs. The taſte of his landſcapes was generally admired; the rocks, ſituations, torrents, and abrupt precipices, were deſigned with ſpirit, and in a grand ſtyle; and his figures recommended themſelves to the eye by a very uncommon correctneſs, propriety, and elegance. He died in 1689.

MONTANISTS, Chriſtian heretics, who ſprung up about the year 171, in the reign of the emperor Marcus Aurelius. They were ſo called from their leader, the hereſiarch Montanus, a Phrygian by birth; whence they are ſometimes ſtyled *Phrygians* and *Cataphrygians*.

Montanus, it is ſaid, embraced Chriſtianity in hopes of riſing to the dignities of the church. He pretended to inſpiration; and gave out, that the Holy Ghoſt had inſtructed him in ſeveral points, which had not been revealed to the apoſtles. Priſcilla and Maximilla, two enthuſiaſtic women of Phrygia, preſently became his diſciples; and in a ſhort time he had a great number of followers. The biſhops of Aſia, being aſſembled together, condemned his prophecies, and excommunicated thoſe who diſperſed them. Afterwards they wrote an account of what had paſſed to the weſtern churches, where the pretended prophecies of Montanus and his followers were likewiſe condemned.

The Montaniſts, finding themſelves expoſed to the cenſure of the whole church, formed a ſchiſm, and ſet up a diſtinct ſociety under the direction of thoſe who called themſelves *prophets*. Montanus, in conjunction with Priſcilla and Maximilla, was at the head of the ſect.

Theſe ſectaries made no alteration in the creed. They only held, that the Holy Spirit made Montanus his organ for delivering a more perfect form of diſcipline than what was delivered by the apoſtles. They refuſed communion for ever to thoſe who were guilty of notorious crimes, and believed that the biſhops had no authority to reconcile them. They held it unlawful to fly in time of perſecution. They condemned ſecond marriages, allowed the diſſolution of marriage, and obſerved three lents.

The Montaniſts became ſeparated into two branches; one of which were the diſciples of Proclus, and the other of Æſchines. The latter are charged with following the heterodoxy of Praxeas and Sabellius concerning the Trinity.

MONTANUS (Benedict Arias), a moſt learned Spaniſh theologian, born in the dioceſe of Badajox, about the year 1528. He aſſiſted at the council of Trent with great reputation; and his merit and writings recommended him to Philip II. of Spain, who employed him in publiſhing a new polyglot bible after the Complutenſian edition, which was printed by the care of Cardinal Ximenes. This bible was printed at Antwerp, whither Montanus went in 1571; and on his return to Spain he refuſed the biſhopric which Philip offered him for his reward, but ſpent the reſt of his days at Sevilla, where he died about the year 1598. Montanus had not only vaſt erudition, but great good ſenſe; he loved ſolitude, was very laborious, never drank wine, and ſeldom ate fleſh.

MONTARGIS, a conſiderable town of France, in the Orleannois, and capital of the Gatinois; ſeated on the river Loir, near a handſome foreſt, 15 miles ſouth of Nemours, and 62 ſouth of Paris. E. Long. 2. 36. N. Lat. 48. 1.

MONTAUBAN, a conſiderable town of France, in Guienne, and territory of Quercy, with a biſhop's ſee, and an academy. The fortifications were demoliſhed in 1629, becauſe it took the part of the Huguenots. It is ſeated on the river Tarne, 20 miles north of Toulouſe, and 30 ſouth of Cahors. E. Long. 1. 27. N. Lat. 43. 56.

MONTBAZON, a town of France, in Touraine, with the title of a duchy; agreeably ſeated at the foot of a hill, on which there is an ancient caſtle, 135 miles ſouth-weſt of Paris. E. Long. 0. 45. N. Lat. 47. 17.

MONTBELLIARD, a handſome and ſtrong town of France, capital of a province of the ſame name, betwen Alſace and the Franche Compte. It is ſeated at the foot of a rock, on which there is a large, ſtrong caſtle, in the form of a citadel. The prince of Montbelliard has a voice and ſeat in the college of the princes of the empire. It was taken by the French in 1674, who demoliſhed the fortifications, but it was reſtored to the prince. It is ſeated near the rivers Alaine and Doux, 33 miles weſt of Baſle, and 45 north-eaſt of Bezanzon. E. Long. 6. 30. N. Lat. 47. 31.

MONTBLANC, a town of Spain, in the province of Catalonia, 15 miles north of Tarragon. E. Long. 1. 5. N. Lat. 41. 20.

MONTBRISION, a conſiderable town of France, and capital of Forez, ſeated on the river Veziza, 40 miles weſt of Vienne, and 250 ſouth by eaſt of Paris. E. Long. 4. 27. N. Lat. 45. 32.

MONTECCHIO, a conſiderable town of Italy, in the duchy of Reggio, 10 miles ſouth-eaſt of Parma, and eight north-weſt of Reggio. E. Long. 15. 54. N. Lat. 38. 8.

MONTE-FALCO, a town of Italy, in the territory of the church and duchy of Spalatto; ſeated on a mountain near the river Clitunno, 12 miles weſt of Spalatto. E. Long. 12. 40. N. Lat. 42. 58.

Monte-Falcone, a town of Italy, in Friuli, with a caſtle. It belongs to the Venetians, and is near the river Ponzano, 10 miles north-weſt of Aquileia, and 12 north weſt of Triſte. E. Long. 13. 0. N. Lat. 46. 4.

Monte-Faiſcone, a ſmall but populous town of Italy, in the territory of the Church, with a biſhop's ſee; ſeated on a mountain, near the lake Bolſena, in a country abounding with excellent wine, 12 miles ſouth-weſt of Orvietto, and 45 north-weſt of Rome. E. Long. 12. 4. N. Lat 42. 26.

Monte-Marano, a populous town of Italy, in the kingdom of Naples, and in the Farther Principato; ſeated on the river Calore, 18 miles ſouth of Benevento. E. Long. 15. 0. N. Lat. 40. 48.

Monte-Mor-o-novo, or *Monte major-el-novo*, a conſiderable town of Portugal, on the road from Liſbon to Badajoz. Long. W. 9. 35. N. Lat. 38. 42.

Monte-Mor-o-velho, or *Monte-major-el-velho*, a town of Portugal in the province of Beira, with a very large caſtle, ſeated in a fertile country, 10 miles ſouth-weſt of Coimbra, and 83 north of Liſbon. W. Long. 8. 9. N. Lat. 40. 5.

Monte-Peloſo, an epiſcopal town of Italy, in the kingdom of Naples, and in the Baſilicata; ſeated on a mountain near the river Baſiento, 14 miles eaſt of Cirenza. E. Long. 16. 28. N. Lat. 40. 46.

Monte-Pulſiano, a town of Italy, in Tuſcany, with a biſhop's ſea; ſeated on a high mountain, near the river Chiana, in a country noted for excellent wine, 25 miles ſouth-eaſt of Sienna, and 50 ſouth by eaſt of Florence. E. Long. 11. 49. N. Lat. 43. 10.

Monte-Sancto, formerly called *Mount-Athos*, a mountain of Turkey in Europe, on the gulph of Conteſſa. It is called Monte-Sancto, or the Holy Mount, becauſe there are 22 monaſteries thereon, in which are 4000 monks, who never ſuffer a woman to come near them. It is 17 miles ſouth of Salonichi. E. Long. 24. 39. N. Lat. 40. 27.

Monte-Verde, a town of Italy, in the kingdom of Naples, and in the Farther Principato, with a biſhop's ſee: 60 miles eaſt of Naples. E. Long. 15. 42. N. Lat. 40. 51.

MONTECUCULI (Raymond de), generaliſſimo of the emperor's army, and one of the greateſt commanders of his time, was born in the duchy of Modena, of a diſtinguiſhed family, in 1608. Erneſt Montecuculi his uncle, who was general of the artillery in the Imperial army, reſolved that he ſhould ſerve firſt as a common ſoldier, and that he ſhould paſs through all the military degrees before he was raiſed to command. This the young Montecuculi did with applauſe. In 1644, when he was at the head of 2000 horſe, he ſurpriſed by a precipitate march 10,000 Swedes, who laid ſiege to Nemeſſau in Sileſia, and obliged them to abandon their artillery and baggage; but a ſhort time after, he was defeated and taken priſoner by the general Banier. Having obtained his liberty at the end of two years, he joined his troops to thoſe of John de Wert; and defeated general Wrangel in Bohemia, who was killed in the battle. In 1657 the emperor made him general marſhal de camp; and ſent him to the aſſiſtance of John Caſimir, king of Poland. Montecuculi vanquiſhed Ragotzi prince of Tranſylvania, drove out the Swedes, and diſtinguiſhed himſelf in an extraordinary manner againſt the Turks in Tranſylvania and Hungary. In 1673 he commanded the Imperial army againſt the French, and took Bonne; he then proceeded

ceeded with ſeint marches in order to deceive Turenne, in which he obtained great honour. However, the command of that army was taken from him the next year; but it was reſtored to him in 1675, in order that he might make head againſt the great Turenne. All Europe had their eyes fixed on theſe two able warriors, who then made uſe of all the ſtratagems which genius and military knowledge were capable of ſuggeſting. The marſhal de Turenne was obtaining the ſuperiority when he was taken off by a cannon ball. Montecuculi wept at the death of ſo formidable an enemy, and beſtowed upon him the greateſt praiſes. The great prince de Conde was the only French general that could deprive Montecuculi of the ſuperiority he had obtained by Turenne's death. That prince was therefore ſent to the Rhine, and ſtopped the Imperial general; who conſidered this laſt campaign as the moſt glorious of his life, not from his being conqueror, but for his not being conquered, when he was oppoſed by a Turenne and a Conde. He ſpent the reſt of his life at the Imperial court; and died at Lintz in 1680. He wrote *Memoirs;* the beſt edition of which is that of Straſburg, in 1735,

MONTEGO-BAY, a town of Jamaica, and, next to Kingſton the moſt flouriſhing in the iſland, contains above 350 houſes; and carries on a very conſiderable commerce with Great Britain and her remaining colonies in North America. The harbour is capacious; but rather expoſed to the north winds, which at certain times in the year blow with great violence. It is the capital of the pariſh of St James; in which are 70 ſugar-plantations, 70 other ſettlements, and 27,000 ſlaves.

MONTESA, a very ſtrong town of Spain, in the kingdom of Valentia. It is the ſeat of an order of knighthood of the ſame name; and is five miles from Xativa. W. Long. 0. 10. N. Lat. 39. 0.

MONTESQUIEU (Charles de Secondat) baron, a moſt illuſtrious Frenchman deſcended from an ancient and noble family of Guienne, was born at the caſtle of La Brede, near Bourdeaux, in 1689. The greateſt care was taken of his education; and at the age of 20 he had actually prepared materials for his *Spirit of Laws*, by well digeſted extracts from thoſe immenſe volumes of civil law which he had ſtudied, not barely as a civilian, but as a philoſopher. He became a counſellor of the parliament of Bourdeaux in 1714, and was received preſident á mortier two years after. In 1721 he publiſhed his *Perſian Letters;* in which, under the ſcreen of Oriental manners, he ſatirized thoſe of France, and treated of ſeveral important ſubjects by delicate tranſient glances: he did not avow this publication; but was no ſooner pointed out as the author, than zeal without knowledge, and envy under the maſk of it, united at once againſt the Perſian Letters. He was received into the French academy in 1728; and having previouſly quitted his civil employments, he entirely devoted himſelf to his genius, and was no longer a magiſtrate, but a man of letters. Having thus ſet himſelf at liberty, he travelled through Germany, Italy, Switzerland, Holland, and England, in which laſt country he reſided three years, and contracted intimacies with the greateſt men then alive; for Locke and Newton were dead. The reſult of his obſervations was, "that Germany was fit to travel in, Italy to ſojourn in, England to think in, and France to live in." On his return he retired for two years to his eſtate at La Brede, where he finiſhed his work *On the cauſes of the Grandeur and Declenſion of the Romans;* which appeared in 1734. The reputation acquired by this laſt work only cleared the way for his greater undertaking, the *Spirit of Laws*, which was printed at Geneva in 2 vols 4to. 1750. This was immediately attacked by the adverſaries of his Perſian Letters, in a multitude of anonymous pamphlets; containing all the reproaches to which a liberal mind is expoſed from craft and ignorance. M. Monteſquieu drew up a defence of this work; which for truth, moderation, and delicacy of ridicule, may be regarded as a model in its way. This great man was peaceably enjoying that fulneſs of eſteem which his great merits had procured him, when he fell ſick at Paris, and died on the 10th of February 1755.—The following character of this great man is drawn by Lord Cheſterfield. His virtues did honour to human nature, his writings juſtice. A friend to mankind, he aſſerted their undoubted and unalienable rights with freedom, even in his own country; whoſe prejudices in matters of religion and government he had long lamented, and endeavoured, not without ſome ſucceſs, to remove. He well knew, and juſtly admired, the happy conſtitution of this country, where fixed and known laws equally reſtrain monarchy from tyranny, and liberty from licentiouſneſs. His works will illuſtrate his name, and ſurvive him, as long as right reaſon, moral obligation, and the true ſpirit of laws, ſhall be underſtood, reſpected, and maintained." As to his perſonal qualities, we are told by his elogiſt, M. d'Alembert, that, "he was of a ſweet, gay, and even temper. His converſation was ſpirited, agreeable, and inſtructive. Nobody told a ſtory in a more lively manner, or with more grace and leſs affectation. He had frequent abſence of mind; but always awaked from it by ſome unexpected ſtroke that re-animated the languiſhing converſation. Though he lived with the great, he retired whenever he could to his eſtate in the country, and there met his books, his philoſophy, and his repoſe. Surrounded at his leiſure-hours with peaſants, after having ſtudied man in the commerce of the world, he ſtudied him in thoſe ſimple people ſolely inſtructed by nature. With them he cheerfully converſed; he endeavoured, like Socrates, to find out their genius, and appeared as happy with them as in the moſt brilliant aſſemblies; eſpecially when he reconciled their differences, and by his beneficence relieved them from their diſtreſſes."

Beſides the works already mentioned. M. Monteſquieu wrote ſeveral ſmall pieces, as the Temple of Gnidus, Lyſimachus, and Eſſay upon Taſte, which is left unfiniſhed. His works have been collected ſince his death, and printed at Paris in a ſplendid edition, in quarto. They have likewiſe all of them been tranſlated into Engliſh.

MONTEZUMA, or MONTEÇUMA, was emperor or king of Mexico when Cortez invaded that country in 1518, invited thither, as he pretended, by the inhabitants, whoſe children Montezuma, in the blindneſs of his ſuperſtition, had ſacrificed to his idols. The warlike animals on which the Spaniſh officers were mounted, the artificial thunder with which they were armed, the wooden caſtles on which they had croſſed the ocean, the armour with which they were covered, the victories which they gained wherever they went; all theſe circumſtances, added to that fooliſh diſpoſition to wonder which always characteriſes a ſimple people, ſo operated upon the minds of the Mexicans, that when Cortez arrived at the city of Mexico, he was received by Montezuma as his maſter, and by the inhabitants as a god. At firſt they fell down in the ſtreets when a Spaniſh valet paſſed by; but by degrees the court of Montezuma grew familiar with the ſtrangers, and ventured to treat them as men. Montezuma, unable to expel them by force, endeavoured to inſpire them with confidence at Mexico by expreſſions of friendſhip, while he employed ſecret means to weaken their power in other quarters. With this view, one of his generals, who had private orders to that purpoſe, attacked a party of the Spaniards who were ſtationed at Vera-Cruz; and, although his troops were unſucceſsful, yet three or four of the Spaniards were killed. The head of one of them was carried to Montezuma. In conſequence of this, Cortez did what has been reckoned one of the boldeſt political ſtrokes that ever was performed. He ran to the palace, followed by fifty of his troops; and, by perſuaſion and threats, carried the emperor priſoner into the Spaniſh quarter. He afterwards obliged him to deliver up thoſe who had attacked his troops at Vera-Cruz; and, like a general who puniſhes a common ſoldier, he loaded Montezuma with chains. He next obliged him to acknowledge himſelf in public the vaſſal of Charles V.; and, in name of tribute for this homage, Cortez received 600,000 merks of pure gold. Montezuma ſoon afterwards fell a ſacrifice to his ſubmiſſion to the Spaniards. He and Alvaro, the lieutenant of Cortez, were beſieged in the palace by 200,000 Mexicans. The emperor propoſed to ſhow himſelf to his ſubjects, that he might perſuade them to deſiſt from the attack: but the Mexicans no longer conſidered him in any other light but as the ſlave of foreign conquerors. In the midſt of his ſpeech, he received a blow with a ſtone which wounded him mortally; and he expired ſoon after, A. D. 1520.—See CORTEZ. This unfortunate prince left two ſons and three daughters, who embraced the Chriſtian faith. The eldeſt received baptiſm, and obtained from Charles V. lands, revenues, and the title of Count de Montezuma. He died in 1608; and his family is one of the moſt powerful in Spain.

MONTFAUCON (Bernard de), a very learned Benedictine of the congregation of St Maur, ſingularly famous for his knowledge in Pagan and eccleſiaſtical antiquities, was born of an ancient and noble family in Languedoc, in 1655. He ſerved for ſome time in the army; but the death of his parents mortified him ſo with regard to the world, that he commenced Benedictine monk in 1675, and applied himſelf intenſely to ſtudy. Though Montfaucon's life was long, healthy, retired, and laborious, his voluminous publications ſeem ſufficiently to have employed the whole; excluſive of his greateſt undertaking, for which he will be always memorable. This was his *Antiquité expliqué*, written in Latin and French, illuſtrated with elegant plates, in 10 vol. folio; to which he added a ſupplement of 5 vols more. He died at the abbey of St Germain in 1741.

MONTFERRAT, a province of Italy, with the title of a duchy; bounded on the eaſt by the duchy of Milan, and part of the territory of Genoa; on the north, by the Vercelleſe and Canaveſe; on the weſt, by Piedmont properly ſo called; and on the ſouth by the territory of Genoa, from whence it is ſeparated by the Apennine mountains. It contains 200 towns and caſtles; and is very fertile and well cultivated, abounding in corn, wine, oil, and ſilk. It belongs to the king of Sardinia, and Caſal is the capital town.

MONTFORT, a town of France, in Upper Bretagne, ſeated on the river Men, 12 miles from Rennes. W. Long. 1. 58. N. Lat. 48. 8.

MONTFORT, an handſome and ſtrong town of the Netherlands, in the United Provinces, with an ancient caſtle; ſeated on the river Yſſel, ſeven miles from Utrecht. E. Long. 5. 0. N. Lat. 52. 4.

MONTFORT, a town of Germany, in the circle of Suabia, on the confines of Tirol, 16 miles ſouth of Lindow, and the lake Conſtance. It is capital of a country of the ſame, which has been almoſt all purchaſed by the houſe of Auſtria. E. Long. 9. 51. N. Lat. 47. 22.

MONTFORT-DE-LEMOS, an ancient town of Spain, in the kingdom of Galicia, with a magnificent caſtle, where the Comarca of Lemos reſides. It is ſeated in a fertile country, 25 miles north-eaſt of Orenſa, and 55 ſouth-eaſt of Compoſtella. W. Long. 7. 9. N. Lat. 42. 28.

MONTFORT L'AMULY, a town in the iſle of France, with the title of a duchy, 25 miles from Paris. E. Long. 2. 50. N. Lat. 48. 45.

MONTFORT (Simon Count de), deſcended from an illuſtrious and flouriſhing family, was lord of a ſmall town of the ſame name ten leagues from Paris. He was one of the greateſt generals of the age in which he lived; and he diſplayed his bravery in a voyage beyond ſeas, and in the wars with the Engliſh and Germans. The ſtrength of his conſtitution enabled him to ſupport without inconvenience the ſevereſt labours of the field: his majeſtic ſtature diſtinguiſhed him in the midſt of the battle; and the motion of his ſword was ſufficient to ſtrike terror into his boldeſt enemies. In the greateſt dangers he poſſeſſed the utmoſt coolneſs and preſence of mind: he obſerved every emergency; and was ready to bring aſſiſtance, while he himſelf was employed in attacking the braveſt who made head againſt him. He was appointed to conduct the cruſade againſt the Albigenſes in 1209; and the name of Simon de Montfort is nighly celebrated in this war. He took Beziers and Carcoſſonne, raiſed the ſiege of Caſtelnau, and gained a great victory in 1213 over Peter king of Arragon, Raimond VI. count of Toulouſe, and the counts de Foix and de Cominge. Simon de Montfort was killed at the ſiege of Toulouſe on the 25th of June 1218, by a blow with a ſtone diſcharged by the hands of a woman.—Such was the fate of one who had ſullied the glory of his victories by the cruelty of his executions.—Some hiſtorians have given him the name of *Maccabeus* and of *Defender of the Faith*; but men, animated with the true ſpirit of Chriſtianity, have revolted againſt ſuch titles. "We cannot (ſays the Abbé Nonotte) read the accounts of his ſeverity, or rather cruelty, towards the Albigenſes without horror. He was not guided by the ſpirit of the religion of Jeſus

Montgatz, Montgeron.

ſus in the maſſacre of Beziers, the pillage of Carcaſſonne, and the taking of Lavaur. But our horror is ſomewhat diminiſhed by the conſideration of the dreadful revolt, and maſſacres committed by the Albigenſes themſelves." Simon de Montfort treated them at the beſt with as great cruelty as they had done the Catholics. His younger ſon afterwards made a great figure in England, and is known by the title of Earl of Leiceſter.

MONTGATZ, a town of Lower Hungary, in the country of Pereczas, with a fortreſs compoſed of three caſtles, ſeated on a craggy rock. It is encompaſſed with a great moraſs, and art and nature have rendered it almoſt impregnable. It was defended by the Princeſs Ragotſky, wife of Count Tekeli, when beſieged by an army of the imperialliſts, who were obliged to raiſe the ſiege in 1688.

MONTGERON (Louis-Baſile-Carre de), was born at Paris, A. D. 1686; his father was maſter of requeſts. He was ſcarcely 25 years of age when he purchaſed the place of counſellor in parliament, where by his wit and external qualifications he gained conſiderable reputation. Deeply engaged in all the vices which flow from irreligion, he was converted by an unexpected circumſtance. He went on the 7th of September 1731 to the tomb of Deacon Paris, with an intention to examine, with the rigour of the ſevereſt critic, the miracles which were reported to be performed there. But, according to his own account, he felt himſelf ſuddenly beat to the earth by innumerable flaſhes of light with which he was ſurrounded. His incredulity was converted into flaming zeal, and he became the apoſtle of the ſaint whom he formerly ridiculed. From that moment he devoted himſelf to the fanaticiſm of *convulſions*, with the ſame impetuoſity of character with which he had run into the moſt ſhameful exceſſes. He had not long been the diſciple of Janſeniſm, when he ſuffered perſecution. When the chamber of inqueſts was baniſhed in 1732, he was ſent into the mountains of Auvergne; which, inſtead of cooling, tended rather to inflame his zeal. During his exile, he formed the plan of collecting the proofs of the miracles wrought at the tomb of the Abbé Paris, and of compoſing what he called a *Demonſtration of them*. On his return to Paris, he prepared to execute this plan; and on the 29th of July 1737, he actually preſented to the king at Verſailles a volume in quarto ſuperbly bound. This work he accompanied with a ſpeech, which is a mixture of zeal and argument in a tolerable ſtyle. In conſequence of this work, which ſome conſider as a maſterpiece of eloquence, and others as a maſs of abſurdities, he was committed to the Baſtile. After a few months confinement, he was ſent to an abbey of Benedictine monks in the dioceſe of Avignon; whence he was, in a ſhort time carried to Viviers. He was afterwards confined in the citadel of Valence, where he died, A. D. 1754, aged 68. The work which he preſented to the king, was entitled *La verité des Miracles operées par l'interceſſion de M. Paris*, &c. &c.—The critics, even to this day, ſeem to be guided in their opinion concerning this book either by hatred or by enthuſiaſm. "It would be extremely raſh (ſays the Abbé de St Pierre, in the ſecond volume of his *Annales*, p. 593.) to maintain with the Moleniſts, that no miraculous cure was ever performed at the tomb of the Abbé Paris; and to ſay with the Janſeniſts, that theſe cures were performed by a ſupernatural power, would be the height of fanataciſm. The truth is (adds the ſame author), that no miracle appears ever to have been performed at this tomb except in the cure of the human body; in all other caſes, there would have been the want of that imagination on which the whole miracle depended." Thus, although Montgeron ventured to compare theſe prodigies with the miracles of Jeſus Chriſt and his apoſtles, yet we find no perſon raiſed from the dead, no multiplication of loaves, no command obeyed by the elements, and no blind or deaf reſtored to their ſight or hearing. It belongs to the Author of nature alone, or to thoſe who have derived power from him, to work ſuch miracles as are recorded by the evangeliſts, or in the hiſtory of the apoſtles. Montgeron added a ſecond and third volume on the ſame ſubject; he left alſo in manuſcript a work which he compoſed in priſon *contre les Incredules*. Religion, it muſt be confeſſed has had much more powerful advocates. Fortunately Paſcal and Boſſuet are among the number: and it could well have wanted both Paris and Montgeron, whatever virtues they might poſſeſs in other reſpects.

Montgomery.

MONTGOMERY, the capital of a county of the ſame name in north Wales, 158 miles from London, took its name from Roger de Montgomery earl of Shrewſbury, who built the caſtle: but it is called by the Welſh *Tre Valdwin*, that is, Baldwin's town; having been built by Baldwin, lieutenant of the marches of Wales, in the reign of William I. The Welch, after having put the garriſon to the ſword, demoliſhed it in 1095; but Henry III. rebuilt it, and granted it the privileges of a free borough, with other liberties. It is a large and tolerably well built town, in a healthful ſituation and fertile ſoil. It ſends a member to parliament, and has the title of an earldom. It had formerly a tower and caſtle; but they were demoliſhed in the civil wars. It has a weekly market, and four fairs.

MONTGOMERY (Gabriel de), count de Montgomery in Normandy, was remarkable for his valour and noble atchievments, but ſtill more ſo for being ſo unfortunate as to put out the eye of Henry II. on the 29th of June 1559. That prince having engaged ſeveral knights in a tournament, given by him on occaſion of the marriage of his daughter the princeſs Elizabeth with Philip king of Spain, at laſt wiſhed to break a lance with the young Montgomery, at that time lieutenant of the Scotch guard. Montgomery, as if he had foreſeen the fatal conſequences, again and again declined the combat, and it was with great reluctance he at length yielded, when he ſaw the king about to take offence at his refuſal. In the courſe, his lance broke in the king's viſor, and wounded him in the eye. Henry died on the 11th day after receiving the wound, and gave orders on his death-bed that Montgomery ſhould not be proſecuted, or harraſſed in any reſpect, on account of what had happened. After this unlucky accident, Montgomery retired for ſome time to his eſtate in Normandy. He next viſited Italy and other foreign countries; and did not return to France till the commencement of the civil wars, when he joined the party of the Proteſtants, and became one of their principal leaders. In 1562, he defended Rouen againſt the royal army with great valour and obſtinacy. The city being at length taken by ſtorm, he threw himſelf into a galley; and having, with equal temerity and good fortune, ſurmounted by dint of rowing a chain which had been thrown acroſs the Seine at Candebec for the purpoſe of preventing ſuccours from England, he eſcaped to Havre. In 1569 Montgomery was ſent to the aſſiſtance of Bearn, which the Catholics, under the command of Terrides, had almoſt entirely wreſted from the hands of Jane d'Albret, queen of Navarre. He executed this commiſſion with ſo great diſpatch, that Terrides was obliged to raiſe the ſiege of Navarreins, and to retire with great precipitation to Orthez. Montgomery purſued him to this city, which he took by aſſault; and before Terrides had time to recover himſelf, he and his principal officers were taken priſoners in the caſtle. After this defeat, the reſt of Bearn ſubmitted to the conqueror whereever he made his appearance. This expedition acquired him the greateſt glory, and has been celebrated by the Catholic no leſs than by the Proteſtant hiſtorians. He was at Paris at the time of the maſſacre on St Bartholomew's day 1572, and lodged in the Faubourg St Germain. Some accident having retarded the execution of that quarter, he was informed of it at the very moment when it was about to begin; and he had juſt ſufficient time to mount his horſe and, in company with ſome Proteſtant gentleman who lodged near him, to make his eſcape at full gallop. They were purſued as far as Montfort-l'Amaury; and Montgomery, whoſe eſcape alone is particularly attended to, owed his ſafety on this occaſion to the ſwiftneſs of his horſe, which, according to a manuſcript of that time, carried him 30 leagues without halting. Having eſcaped this danger, he took refuge with his family, firſt in the iſland of Jerſey and afterwards in England. The following year, Montgomery carried a conſiderable fleet, which he had armed and fitted out in England, partly on his own credit and partly on that of the inhabitants of Rochelle, to the relief of that city, which was at that time beſieged by the Catholics: But, whether diſtruſting his forces, or for other reaſons about which hiſtorians do not agree, he left the road without fighting the Catholic fleet, and went to pillage Belleiſle on the coaſt of Brittany. Having diſbanded his fleet, he returned to England to Henry de Champernon his ſon in law, coaſt admiral of Cornwall. On the renewal of the war in France in 1573 Montgomery, who was then in Jerſey, paſſed over into Normandy, and joined the proteſtant nobility of that province. Matignon, lieutenant general in Lower Normandy, to whom Catharine de Medicis had given a particalar charge to uſe his utmoſt endeavours to ſeize the perſon of the count, came unexpectedly upon him in Saint-Lo, and laid ſiege to that city. On the evening of the fifth day of the ſiege, Montgomery left Saint-Lo with between 60 and 80 horſe, forced the guard in the ſuburbs, and eſcaped amidſt a ſhower of muſket bullets, without loſing a ſingle man, leaving the command of the place to Coulombieres, François de Briqueville. Montgomery arrived at Domfront May 7, 1574, with only twenty followers, intending to make no longer a ſtay in that place than was neceſſary to recruit them after the fatigues of ſo rapid a march. The ſame day he was joined by ſeveral gentlemen, who brought to his aſſiſtance a company of forty horſe.—Meanwhile Matignon, informed of his eſcape, and enraged at having loſt his prey, flew at the head of a party of horſe, with ſome companies of foot mounted on horſeback, and arrived on the morning of the 9th before Domfront. He blocked up the place on all ſides till the infantry and cannon which followed him ſhould arrive. On their arrival, he atacked the city with great violence: and, as it was impoſſible to defend it, Montgomery was ſoon obliged to retire into the caſtle with the garriſon amounting to no more than 150 men, including 80 foot ſoldiers who guarded the city when he entered it. He ſuſtained a furious aſſault, fought with the greateſt boldneſs and obſtinacy, and expoſed himſelf in the breach like one who wiſhed for death. Perceiving, however, that his ſoldiers partly by the fire of the enemy, and partly by conſtant deſertion, were reduced almoſt to nothing, he capitulated on the 27th of May. Many Proteſtant hiſtorians affirm, that the articles of capitulation were violated with regard to Montgomery; but, not to mention the teſtimony of others, it appears evident, from the authority of D'Aubigny himſelf, who of all the Proteſtant writers is moſt worthy of credit, that the Count had no promiſe from Matignon, except perſonal ſafety and good treatment while he continued his priſoner. This general gave him no aſſurance of pardon from the king or the queen-mother. After the capture of Domfront, Matignon conducted his priſoner to Saint-Lo, the ſiege of which was ſtill going on, in hopes that he might have ſome influence with his former friend and fellow-ſoldier to perſuade him to ſurrender. For this purpoſe, Montgomery was brought to the ſide of the ditch; and he exerted Coulombieres, who appeared on the wall, to follow his example. But Coulombieres, full of indignation, reproached him in the ſevereſt and moſt upbraiding terms for his cowardice in entering into a ſhameful capitulation, inſtead of dying in the breach like a ſoldier, with his ſword in his hand. This intrepid governor ſpoke the true ſentiments of his heart; for when the aſſault was made ſome days after, he was killed defending the breach. In the mean time, Matignon received orders from Catharine de Medicis, now regent of the kingdom by the death of Charles IX. to ſend Montgomery to Paris under a ſtrong guard. When he arrived there, he was conducted to the gaol belonging to the parliament, and confined in the tower which ſtill bears his name. Commiſſioners were appointed by the queen to conduct his trial. He was interrogated concerning the conſpiracy imputed to the admiral Coligny; but the principal charge on which his condemnation was founded, was his hoiſting the Engliſh flag on board of theſe ſhips which he intended for the relief of Rochelle. The ſentence by which he was condemned alſo deprived his children of the title of nobles. When Montgomery heard this part of the ſentence read, *If they have not the virtue of nobles to retrieve this loſs* (ſaid he), *I conſent to their degradation.*—After undergoing a very ſevere torture, he was carried to the place de Greve, dreſſed in mourning, and there beheaded on the 26th of June 1574. D'Aubigny, who was preſent at his execution, and who ſtood immediately behind Fervaques, ſays that he appeared on the ſcaffold with a firm aud undaunted countenance; and gives us a pretty long ſpeech which he delivered on that occaſion, addreſſing himſelf firſt to the ſpectators

tators on one ſide of the river, and then to thoſe on the other. When he had finiſhed his ſpeech, he fell down upon his knees beſide the block; bade adieu to Fervaques, whom he perceived in the crowd; requeſted the executioner not to cover his eyes; and ſubmitted to his fate with a conſtancy truly admirable.

Montgomery has always been conſidered as a victim to the unjuſt revenge of Catherine de Medicis. It is evident that he could not be proſecuted or puniſhed for the death of Henry II.; but it has been ſaid, that, after a misfortune of this kind, which was productive of ſo many calamities to the ſtate, Montgomery was much leſs excuſable than the other Proteſtants, in carrying arms againſt his ſovereign, the ſon of that very king of whom he had deprived France. This conſideration is mentioned by the Catholics as one reaſon for diminiſhing our concern at the tragical death of this illuſtrious hero. Montgomery married in 1549 Eliſabeth de la Fouche of a noble family in Brittany: he left ſeveral children, but their number is not exactly known:

He was the eldeſt ſon of *James de Montgomery*, Seigneur de Lorges in the Orleannois, one of the braveſt men of his age, and famous under the name of *Lorges* in the wars of Francis I. In 1545 he ſucceeded John Stuart count d'Aubigny in the command of the hundred archers in the Scotch guard; and his ſon was lieutenant, or perhaps captain, in ſurvivancy when he killed Henry II. It is ſingular that the ſame Lorges, father of Montgomery, had wounded Francis I. in the chin with a firebrand, in ſome frolic with that prince. This accident occaſioned the wearing of long beards in France for 50 years. Lorges died aged above 80, a ſhort time after Henry II. He obtained the title of count de Montgomery in 1453, pretending that it belonged to his anceſtors, and that he was deſcended, by the earls of Eglinton in Scotland, from a younger ſon of the ancient houſe of Montgomery eſtabliſhed in England. According to a memoir given by the family to the author of the Genealogical Dictionary, James was the ſon of Robert Montgomery, who left Scotland and entered into the ſervice of the French king about the beginning of the reign of Francis I. and this Robert was grandſon to Alexander Montgomery, couſin by the mother's ſide to king James I. king of Scotland.

Montgomeryshire, a county of North Wales, 40 miles in length and 37 in breadth; bounded on the north by Merionethſhire and Denbighſhire, on the north-eaſt and eaſt by Shropſhire, on the ſouth by Radnorſhire and Cardiganſhire, and on the weſt by the laſt mentioned county and part of Merionethſhire. It is divided into ſix hundreds; and contains ſix market-towns, 47 pariſhes, and about 5660 houſes, and 33,960 inhabitants. It lies in the three ſeveral dioceſes of St Aſaph, Bangor, and Hereford; but ſends only two members to parliament, one for the county, and one for the town of Montgomery. The air is pleaſant and ſalubrious; but this county being extremely mountainous, is not very fertile, except in the valleys, which afford ſome corn and plenty of paſture; however, the ſouth, ſouth-eaſt, and north-eaſt parts being much more level, are extremely fruitful, eſpecially a pleaſant vale, through which the Severn glides in beautiful meanders.

MONTH, the twelfth part of a year. See Chronology, N° 17.

Month, in its proper acceptation, is that ſpace of time which the moon takes up in paſſing from any certain point to the ſame again, which is called a *periodical month;* or it is the ſpace of time between two conjunctions of the moon with the ſun, which is called a *ſynodical month*. That ſpace of time which the ſun takes up in paſſing through one ſign or 12th part of the zodiac, is alſo called (but improperly) a *month*. So that there are two ſorts of months; *lunar*, which are meaſured by the moon; and *ſolar*, which are meaſured by the ſun. The lunar periodical month conſiſts of 27 days, 7 hours, 43 minutes, 5 ſeconds: The lunar ſynodical month is 29 days; 12 hours, 44 minutes, 3 ſeconds, and 11 thirds. A ſolar month contains upon a mean calculation, 30 days, 10 hours, 29 minutes, 5 ſeconds.

The Jews, Greeks, and Romans, made uſe of lunar ſynodical months, but to avoid fractions, they conſiſted alternately of 29 and 30 days. The former the Romans called *cavi*, and the Greeks χοιλοι; the latter were termed *pleni* and πληρεις.

1. The Hebrew months were ranged differently in their ſacred and in their civil year.

	Order of the ſacred Year.				Order of the civil Year.		
1	*Niſan*	Anſwering to our	Mar.	1	*Tiſri*	Anſwering to our	Sept.
2	*Jiar*		Apr.	2	*Murſchevan*		Oct.
3	*Sivan*		June	3	*Caſleu*		Nov.
4	*Thammuz*		May	4	*Thebet*		Dec.
5	*Ab*		July	5	*Sebat*		Jan.
6	*Elul*		Aug.	6	*Adar*		Feb.
7	*Tiſri*		Sep.	7	*Niſan*		Mar.
8	*Marſchevan*		Oct.	8	*Jiar*		Apr.
9	*Caſleu*		Nov.	9	*Sivan*		May
10	*Thebet*		Dec.	10	*Thammuz*		June
11	*Sebat*		Jan.	11	*Ab*		July
12	*Adar*		Feb.	12	*Elul*		Aug.

Theſe months being lunar cannot exactly anſwer to our ſolar months; but every Jewiſh month muſt be conceived to anſwer to two of ours, and partake of both. As theſe 12 lunar months conſiſted only of 354 days, the Jews, in order to bring it nearer to the true year, took care every three years to intercalate a 13th month into the number, which they called *veadar*, or the ſecond adar. The new moon was always the beginning of the month; and it is ſaid the Jews had people poſted on elevated places, to give notice to the Sanhedrim as ſoon as ſhe made her appearance: After this, proclamation was made by ſound of trumpet, and "the feaſt of the new moon, the feaſt of the new moon," reſounded amongſt the people.

The ancient Hebrew months were of 30 days each, excepting the laſt, which conſiſted of 35; ſo that the year contained 365 days, with an intercalary month at the end of 120 years, which, by abſorbing the odd hours which remained at the concluſion of each year, brought it back nearly to its proper place. This regulation of the year was borrowed from the Egyptians.

2. The months of the Athenian year, as we have before obſerved, conſiſted alternately of 29 and 30 days. The firſt month, according to Meton's reformation of the kalendar, began with the firſt new moon after the ſummer ſolſtice, and was called *hecatombeon*, anſwering to the latter half of June, and the

Month. former half of July. The order of the months, with the number of days in each, are as follows:

1	*Hecatombæon,*	30	7	*Poſideon,*	30
2	*Metagitnion,*	29	8	*Gamelion,*	29
3	*Boedromion,*	30	9	*Elaphebolion,*	30
4	*Mæmacterion,*	29	10	*Munichion,*	29
5	*Pyanepſion,*	30	11	*Thargelion,*	30
6	*Antheſterion,*	29	12	*Scirrophorion,*	29

Each month was divided into three decades of days called δεκημερα. The firſt was called Μηνος αρχομενȣ or ισαμενȣ, or the decade of the beginning of the month; the ſecond was Μηνος μεσȣντος or the decade of the middle; and the third was Μηνος φθινοντος, παυομενȣ or ληγοντος, the decade of the expiring month.

The firſt day of the firſt decade was termed Νεομηνια, becauſe the firſt month began with the new moon; the ſecond day was δευτερα ισαμενȣ; the third τριτη ισαμενȣ, &c. The firſt day of the ſecond decade was πρωτη μεσȣντος, the ſecond δευτερα μεσȣντος, &c.—the days of this decade were alſo called πρωτη επι δεκα, δευτερα επι δεκα, &c The firſt day of the third decade was πρωτη επ' εικαδι; the ſecond was δευτερα επ' εικαδι, &c. i e. the firſt, ſecond, &c. after 20, becauſe the laſt decade began on the 20th day. This decade was alſo counted by inverſion thus; φθινοντος δεκατη the 21ſt, φθινοντος εννατη the 22d, φθινοντος ογδοη the 23d, and ſo of the reſt to the laſt day of the month, which was called ενη και νεα, the old and the new, becauſe one part of that day belonged to the old and the other to the new moon; but after the time of Demetrius, the laſt day of the month was called from him Δημητριας; it ſometimes was named τριακας.

The Grecian months, thus conſiſting of 29 and 30 days alternately, fell ſhort of the ſolar year 11 days 6 hours. To remedy this defect the cycle of four years, called τετραετηρις, was invented.—In this cycle, after the firſt two years, they added an intercalated month called εμβολιμος, conſiſting of 22 days; and again, after the expiration of two years more, they inſerted another month of 23 days, the fourth part of a day having in the ſpace of four years amounted to a whole day. See Year.

3. The Roman year under Romulus conſiſted of 10 months only, and began with March, which contained 31 days, then followed April which had 30, May 31, June 30, *Quintilis* 31, *Sextilis* 30, September 30, October 31, November 30, December 30. Theſe 10 months containing no more than 304 days, this account was in a ſhort time found to be deficient. Numa Pompilius, therefore, took away one day from each of theſe ſix months, April, June, *Sextilis*, September, November, December; and to the ſix days thus obtained he added 51, which was the number that Romulus's year, in his opinion, wanted to make it perfect. Numa had now 57 days to diſpoſe of; he therefore divided them, and conſtituted two other months, January and February; the former conſiſting of 29 and the latter of 28 days. The month of January, which he placed at the winter ſolſtice, he made inſtead of March to begin the year. Thus Numa's year conſiſted of 355 days: but this being found 11 days 6 hours ſhort of the ſolar year, he made uſe of the intercalation of 90 days at the expiration of eight years perpetually: which number, being made up of the 11 days and a quarter, kept the year pretty well to its place. The beginning of the year in Julius Cæſar's time had anticipated its true place 67 whole days: theſe he intercalated betwixt November and December; ſo that the year conſiſted, for this one time of 15 months or 445 days. This reformation was called the *Julian correction*, and this year the *year of confuſion*. At the end of 12 years, by the ignorance of prieſts, who did not underſtand intercalation, 12 days had been intercalated for nine. This was obſerved by Auguſtus Cæſar, and rectified, by ordering 12 years to paſs without any intercalary days. The order and ſucceſſion of months was the ſame as that of Numa: But January, March, May, *Quintilis*, *Sextilis*, October, and December, had each 31 days; April, June, September 30, and February, in common years, 28; but every fourth year or biſſextile 29. This, with a very little difference, is the account obſerved at preſent. *Quintilis*, in compliment to Julius Cæſar, was called *July*, becauſe in this month he was born; and *Sextilis*, in honour of Auguſtus, was called *Auguſt*; both which names are ſtill continued.—See Year.

Each month by the Romans was divided into *kalends*, *nones*, and *ides*, all of which were reckoned backwards. The *kalends* were the firſt day of the month. The *nones* fell on the ſeventh, and the *ides* on the 15th, of March, May, July, October—but in all other months the *nones* were on the fifth, and the *ides* on the 13th. For the more eaſy comprehenſion of the Roman manner of dating, according to this diviſion of the months, here follows a table.

	March May July October	January Auguſt December	April June September November	February.
1	*Kalendæ*	*Kalendæ*	*Kalendæ*	*Kalendæ*
2	6	4	4	4
3	5	3	3	3
4	4	*Prid.Non.*	*Prid.Non.*	*Prid.Non.*
5	3	*Nonæ*	*Nonæ*	*Nonæ*
6	*Prid.Non.*	8	8	8
7	*Nonæ*	7	7	7
8	8	6	6	6
9	7	5	5	5
10	6	4	4	4
11	5	3	3	3
12	4	*Prid.Idus*	*Prid.Idus*	*Prid.Idus*
13	3	*Idus*	*Idus*	*Idus.*
14	*Prid.Idus*	19	18	16
15	*Idus*	18	17	15
16	17	17	16	14
17	16	16	15	13
18	15	15	14	12
19	14	14	13	11
20	13	13	12	10
21	12	12	11	9
22	11	11	10	8
23	10	10	9	7
24	9	9	8	0
25	8	8	7	5
26	7	7	6	4
27	6	6	5	3
28	5	5	4	*Prid.Kal.*
29	4	4	3	
30	3	3	*Prid.Kal.*	
31	*Prid.Kal.*	*Prid.Kal.*		

N. B. Every leap-year, February conſiſting of 29 days, the 24th and 25th of that month are written *ſexto Kal. Mart.*; hence leap-year is called *Biſſextilis*.

MON,

Montia
||
Montpelier.

MONTIA, in botany: A genus of the tryginia order, belonging to the triandria claſs of plants: and in the natural method ranking with thoſe with which the order is doubtful. The calyx is dyphillous; in corolla monopetalous and irregular; the capſule unilocular and trivalved,

MONTINIA, in botany; A genus of the tetrandria order, belonging to the dioecia claſs of plants. The perianthium of the male is quadridented ſuperior; and there are four petals. The female calyx and corolla are as in the male; the filaments barren; the ſtyle bifid; the capſule oblong and bilocular.

MONTMEDI, a ſmall but ſtrong town of France, in Luxemburg, ſeated on the river Chire, which devides it into the upper and lower towns. It is 22 miles ſouth-eaſt of Sedan, 27 ſouth-weſt of Luxemburg, and 135 north-eaſt of Paris. E. Long. 5. 23. N. Lat, 49. 32.

MONTMORENCI (Francois Henry de.) See Luxemburg.

MONTMORENCY, a town of France, with the title of a duchy, remarkable for the tombs of the dukes of this name. It is ſeated on a hill, near a large valley, fertile in fruits, eſpecially excellent cherries. E. Long. 2. 24. N. Lat. 48. 59.

Montmorency (Anne de), a peer, marſhal, and conſtable, of France, and one of the greateſt generals of the 16th century, defended, in 1512, the city of Menziers againſt the emperor Charles V. and obliged the count of Naſſau to raiſe the ſiege. The following year he was made marſhal of France; and in 1525, following king Francis I. into Italy, he was taken with that prince at the battle of Pavia, which was fought contrary to his advice. The important ſervices he afterwards rendered the ſtate were rewarded by the ſword of conſtable of France, with which he was preſented by the king on the 10th of February 1538. He afterwards underwent various revolutions of fortune both at court and in the field. At laſt, being wounded at the battle of St Denis, which he gained on the 10th of November 1567, he died of his wounds two days after, at 74 years of age. It is ſaid, that a cordelier attempting to prepare him for death, when he was covered with blood and wounds, after the battle of St Denis, he replied in a firm and ſteady voice: "Do you think that a man who has lived near 80 years with honour, has not learnt to die for a quarter of an hour?"

MONTPELIER, one of the handſomeſt towns of France, and the moſt conſiderable in Languedoc excepting Tholouſe, is ſituated in E. Long. 4. 20. N. Lat. 45. 58. It hath a citadel, a biſhop's ſee, an univerſity, a royal academy of ſciences, and a mint. This town has been long famous for a ſalubrious air and ſkilful phyſicians. In reality the air may be ſalutary in catarrhous conſumptions from its dryneſs and elaſticity; but it is too ſharp in caſes of pulmonary impoſthumes. The climate, according to ſome late travellers, is ſo much altered for the worſe, that the inhabitants themelves ſcarce know it to be the ſame: it has been changing many years, and every year becomes worſe and worſe. It has been known to rain almoſt three months without intermiſſion: and at intervals ſuch thick ſtinking fogs, as nothing but the bank of Newfoundland could equal: and ſeveral times, for two or three days on a ſtretch, the ſky is ſo heavily loaded, that neither ſun, moon, nor ſtar, can be ſeen. In ſummer it is ſo inſufferably hot, that till the cool of the evening there is no ſtirring out. Its ſituation, though on an eminence, never could be healthy: as between it and the Mediterranean (which is about three leagues diſtant) it is one continued marſh and ſwamp, ever covered with noxious vapours, which, when the ſea-breeze ſets in, blows directly on the town and the country adjacent; of the ſad effects of which, its unhealthy inhabitants, with their yellow meagre looks, are the moſt convincing proofs.

Montpelier.

The town has nothing curious to induce a ſtranger to ſtay longer in it than three or four days, except he arrives there about Chriſtmas; at which time it is very gay, as all the nobility of Languedoc meet there at that time to ſettle the affairs of the province, though it is not the capital, but eſteemed nearly the centre. There is during that time a play, which, with an indifferent concert, are all the public amuſements. The people in trade are reputed by the French themſelves to be the greateſt extortioners, and ſure not to let a penny eſcape them, be the means to come at it ever ſo unjuſt; as an inſtance, they had the conſcience to charge an Engliſh ſea officer that died there, 300 livres (twelve guineas and a half) for eight days lodging.

This city ſtands upon a riſing ground fronting the Mediterranean, which is about three leagues to the ſouth-ward; on the other ſide is an agreeable plain, extending about the ſame diſtance towards the mountains of the Cevennes. It is reckoned well built, and what the French call *bien percee*: yet the ſtreets are in general narrow and the houſes dark. The inhabitants are ſuppoſed to amount to 40,000: they are ſociable, gay and good tempered, and they trade very largely in wine cordials, oil, verdigreaſe, and ſalt-petre. They have ſeveral manufactures in ſilk and woollen goods. There are many Proteſtants here and at Niſmes. The markets are well ſupplied with fiſh, poultry, butcher's meat, and game, at reaſonable rates. The wine of the country is ſtrong and harſh: Burgundy is dear, and ſo is the ſweet wine of Frontignan, though made in the neighbourhood of Cette. Liquors of various ſorts are compounded and diſtilled at Montpelier. The environs are extremely pleaſant, having on one ſide La Place de Peyrou, which forms a fine terrace. From thence, on a clear day, may be ſeen to the eaſtward the Alps, which form the frontiers of Italy; to the ſouth-weſt the Pyrenean mountains, which form thoſe of Spain, each eſteemed fifty leagues diſtant; and to the ſouthward a moſt extenſive view of the Mediterranean. Not far from thence is a noble aqueduct, built like two bridges one above the other; by this water is brought from a mountain at three leagues diſtance, into two baſons in a ſmall elegant temple at the weſt end of the place; and the king's garden, where on certain days public lectures are held on botany. On the other ſide of the town is the eſplanade, a beautiful walk, bordered on each ſide by olive trees, from whence there is a pleaſing proſpect of the ſea and the country adjacent to the town: near which is the citadel, a place of no ſtrength though well walled in, as it is commanded by ſeveral riſing grounds, and has only a dry ditch. There are commonly kept there four battalions of infantry.—

Should an Engliſhman chooſe to reſide here any time, the Grande Rue, that is, the great ſtreet, is the genteeleſt quarter to reſide in, where 12 or 18 livres a month is the price for a genteel chamber, which in the time of the ſtates would let for 60; and if he does not chooſe to meſs with the officers, there is a genteel ordinary, where the Engliſh commonly eat, in the Rue d' Argenterie, which is contiguous to your lodgings. Families who reſide here find their account in keeping houſe; and every traveller who deſigns to ſtay longer than a day or two in any of theſe towns, will do well to write beforehand to his correſpondent to procure furniſhed lodgings, to which he may be driven immediately, without being under the neceſſity of lying in an execrable inn, where he muſt pay four livres a head for every meal, and ſix livres a day for an apartment.

MONTREAL, an iſland of north America, in the river St Laurence, about ſix leagues and a half in length, and three leagues over in the broadeſt parts, It belonged to the French; but was taken by the generals Amherſt and Murray on the 8th of September 1760, without firing a gun, According to the terms of capitulation, all the French forces were to be ſent to Old France; and conſequently all Canada became ſubject to the Crown of Great Britain; which ceſſion was confirmed by the peace of 1763. The ſoil of the iſland is exceedingly rich and good, producing all kinds of European fruits and vegetables in great abundance, with variety of garden fruits. The ſouth ſide is the moſt inhabited, of courſe beſt cultivated; and beſides the ſettlements, which are numerous, the iſland is adorned with villas, for the retirement of the more wealthy merchants during the ſummer ſeaſon. No Indians are ſettled here; nor are they fond of ſettling on iſlands, from an hereditary diſtruſt leſt they ſhould be cut off by the Europeans. Since this place has been in the poſſeſſion of Britain, it has ſuffered much by fires, the houſes being moſtly built of wood.

The town of Montreal, ſituated on this iſland, and formerly called *Ville Marie*, is the ſecond place in Canada for extent, buildings, and ſtrength; and beſides poſſeſſing the advantage of a leſs rigorous climate; for delightfulneſs of ſituation is infinitely preferable to Quebec. It ſtands on the ſide of a hill, ſloping down to the ſouth, with many agreeable villas upon it, which with the iſland of St Helen, and the river (which is here about two miles broad), form a moſt charming landſcape. Though the city is not very broad from north to ſouth, it covers a great length of ground from eaſt to weſt, and is nearly as large and populous as Quebec. The ſtreets are regular, forming an oblong ſquare; the houſes well built, and in particular the public edifices, which far exceed thoſe of the capital in beauty and commodiouſneſs; the reſidence of the knights hoſpitallers being extremely magnificent.—There are ſeveral gardens within the walls, in which, however, the proprietors have conſulted uſe more than elegance, particularly thoſe of the Siſters of the Congregation, the Nunnery Hoſpital, the Recollets, Jeſuits Seminary, and Governor. Beſides theſe, there are many other gardens and beautiful plantations without the gates, as the garden of the General Hoſpital, and the improvements of Mr Liniere, which exceed all the reſt, and are at an agreeable diſtance on the north ſide of the town. The three churches and religious houſes are plain, and contain no paintings, nor any thing remarkably curious, but carry the appearance of the utmoſt neatneſs and ſimplicity. The city has ſix or ſeven gates, large and ſmall; but its fortifications are mean and inconſiderable, being encompaſſed by a ſlight wall of maſonry, ſufficient only to overawe or prevent a ſurpriſe from the numerous tribes of Indians with whom they are ſurrounded, and who uſed to reſort in vaſt bodies to the annual fair held here, which continued from the beginning of June till the latter end of Auguſt, when many ſolemnities were obſerved, at which the governor aſſiſted, and guards were placed to preſerve good order among ſuch a concourſe of different ſavage nations, all of whom are extremely fond of ſpirituous liquors, and when drunk commit great exceſſes, The fortifications were by no means capable of ſuſtaining a regular attack; and though the garriſon in 1760 conſiſted of eight battallions of regular troops, a numerous militia, and a great body of ſavages. M Vaudreuil and Chevalier de Levis ſubmitted without firing a gun. There are no guns mounted on the wall; only a dry ditch ſurrounds it, about ſeven feet deep, encompaſſed with a regular glacis. On the inſide of the town is a cavalier on an artificial eminence, with a parapet of logs or ſquared timbers and ſix or eight guns, called the citadel. Such is the ſtrength of Montreal, the number of whoſe inhabitants may be between 5000 and 6000, extremely gay and well dreſſed. By the ſituation of the place, the inhabitants are well ſupplied with all kinds of river fiſh, ſome of which are unknown to Europeans, being peculiar to the lakes and rivers of this country. They have likewiſe plenty of black cattle, horſes, hogs, and poultry. The neighbouring ſhores ſupply them with a great variety of game in the different ſeaſons; and the iſland abounds with well taſted ſoft ſprings, which form a multitude of pleaſant rivulets. The city now drives a conſiderable trade in furs, &c. and veſſels of 200 tons can come up to it. It ſtands 60 leagues above Quebec.

Montreal, a town of Spain, in the kingdom of Arragon, with a caſtle, ſeated on the river Xiloca, 25 miles N. W. of Tervil, and 43 S. E. of Calataud.—W. Lon. 1. 2. N. Lat. 41. 9.

Montreal, a town of Italy, in Sicily, and in the valley of Mazara, with an archbiſhop's ſee; ſeated on a rivulet, five miles W. of Palermo, and 50 N. E. of Mazara. E. Lon. 13. 13. N. Lat. 38, 14.

Montreal, or *Mount Royal*, a fortreſs of Germany, in the circle of the Lower Rhine, and electorate of Triers; ſeated on the river Moſelle, 22 miles N. E. of Triers. E. Lon. 7. 6. N. Lat. 49. 59.

MONTROSE, a handſome town of North Britain, in the ſhire of Angus, ſituated at the mouth of the river Eſk, on the German Ocean, 46 miles north-eaſt of Edinburgh, but 70 miles diſtance by road. The houſes are neat, and many of them in the modern taſte. The moſt remarkable public buildings are, the town-houſe, the church, and an elegant epiſcopal chapel.—Montroſe is a parliament town, and a dukedom in the family of Graham. It ſtands between two rivers, the ſouth and north Eſks, over which there have been lately built two very handſome bridges, at a great expence. The ſalmon fiſheries on theſe rivers are very valuable, and form a good branch of commerce.

Montroſe, Montſerrat.

merce. The harbour is a fine ſemicircular baſon defended by a handſome ſtone pier. A great number of trading veſſels belong to this port.

MONTROSE (Marquis of). See GRAHAM; and BRITAIN, n° 137, 138, 143, 265.

MONTSERRAT, a mountain of Spain, in Catalonia, one of the moſt ſingular in the world for ſituation, ſhape, and compoſition. It ſtands ſingle, towering over a hilly country like a pile of grotto work or Gothic ſpires; and its height ſo great, that to a beholder on the top, the neighbouring mountains appear to be ſunk to a level with the plain. It is compoſed of ſteep rocks, which at a diſtance ſeem indented; whence it is ſaid to have received the name *Montſerrat* from the Latin word *ſerra* a "ſaw." It is impoſſible to deſcribe the beauty, richneſs, and variety, of the landſcapes diſcovered from the moſt elevated point: but the extenſiveneſs of the proſpect may be conceived by the reader, upon being told that the iſlands of Minorca and Majorca, which are at the diſtance of 60 leagues, are diſcovered from this elevation.

Montſerrat is particularly famous for the adoration that is paid to an image of the Virgin, which, according to tradition, was found in a cave in this mountain by ſome ſhepherds in the year 880. Over this image, Guthred earl of Barcelona cauſed a monaſtery and chapel to be erected; but, after remaining in this receptacle upwards of 700 years, Philip II. and Philip III. built a magnificent church for its reception. Innumerable and aſtoniſhing miracles are aſcribed to this holy image. The convent or monaſtery is ſituated in a nook of the mountain; it ſeems as if vaſt torrents of water, or ſome violent convulſion of nature, had ſplit the eaſtern face of Monſerrat, and formed in the cleft a ſufficient platform to build the monaſtery upon. The river Llobregat roars at the bottom, and perpendicular walls of rock, of prodigious height, riſe from the water edge near half way up the mountain. Upon theſe maſſes of white ſtone reſts the ſmall piece of level ground which the monks inhabit. Cloſe behind the abbey, and in ſome parts impending over it, huge cliffs ſhoot up in a ſemicircle to a ſtupendous elevation: their ſummits are ſplit into ſharp cones, pillars, pipes, and other odd ſhapes blanched and bare; but the interſtices are filled up with foreſts of evergreen and deciduous trees and plants. Fifteen hermitages are placed among the woods; nay, ſome of them on the very pinnacles of the rocks, and in cavities hewn out of the loftieſt of theſe pyramids.

The monaſtery is one of the 45 religious houſes of the Spaniſh congregation of the order of St Benedict; their general chapter is held every fourth year at Valladolid, where the deputies chooſe abbots and other dignitaries for the enſuing quadrennium. In this monaſtery, they elect for abbot a Catalan and a Caſtilian alternately. Their poſſeſſions are great, conſiſting of nine villages lying to the ſouth of the mountain; but the king has lately curtailed their income about 6000 livres a year, by appropriating to his own uſe the beſt houſe in each village, ſome of which, with their tythes, are worth 200 dollars per annum. Their original foundation, in 866, gave them nothing but the mountain; and to donations and economy they owe the great increaſe of their landed property. They are bound to feed and harbour for three days all poor pilgrims that come up to pay their homage to the Virgin; and the allowance is a luncheon of bread in the morning, as much more, with broth, at noon, and bread again at night. Sometimes, on particular feſtivals, 7000 perſons arrive in one day; but people of condition pay a reaſonable price for what they eat.—The number of profeſſed monks, according to Mr Swinburne, is 76 (according to M. Bourgoanne 60); of lay-brothers, 28; and of ſinging boys, 25; beſides phyſician, ſurgeon, and ſervants. The church is a gloomy edifice; and the gilding is much ſullied with the ſmoke of 85 lamps of ſilver, of various forms and ſizes, that hang round the cornice of the Sanctuary. Funds have been bequeathed by different devotees for furniſhing them with oil. The choir above ſtairs is decorated with the life of Chriſt, in good wooden carving. A gallery runs on each ſide of the chancel, for the convenience of the monks. A large iron grate divides the church from the chapel of the Virgin, where the image ſtands in a nich over the altar, before which burn four tapers in large ſilver candleſticks, the preſent of the duke of Medina Celi. In the ſacriſty, and paſſages leading it, are preſſes and cupboards full of relics and ornaments of gold, ſilver and precious ſtones; they point out, as the moſt remarkable, two crowns for the virgin and her ſon, of ineſtimable value; ſome large diamond rings; an excellent cameo of Meduſa's head; the Roman emperors in alabaſter; and the ſword of St Ignatius. But as no offerings to this miraculous ſtatue can be rejected or otherwiſe diſpoſed of, the ſhelves are crowded with moſt whimſical *ex votos*, viz. ſilver legs, fingers, breaſts, ear rings, watches, two wheeled chaiſes, boats, carts, and ſuch like trumpery.

Montſerrat.

On different parts of the mountain, as already noticed, are a number of hermitages. Each of theſe ſolitary retreats, which at a diſtance ſeem deſtitute of every thing, has a chapel, a cell, a well in the rock, and a little garden. The inhabitants of one of them, which is dedicated to St Beneto, has the privilege of making an annual entertainment on a certain day; on which day all the other hermits are invited, when they receive the ſacrament from the hands of the mountain vicar, and after divine ſervice dine together. They meet alſo at this hermitage, on the days of the ſaints to which their ſeveral hermitages are dedicated, to ſay maſs, and commune with each other. But at other times they live in a very ſolitary and recluſe manner, perform various penances, and adhere to very rigid rules of abſtinence; nor do they ever eat fleſh; nor are they allowed to keep within their walls either dog, cat, bird, or any living thing, leſt their attention ſhould be withdrawn from heavenly to earthly affections. Moſt of theſe hermits are ſaid to be perſons of fortune and family, diſguſted with the world, who have retired thither to devote themſelves to meditation, ſelf-denial, and contrition.

MONTSERRAT, one of the Carribbee Iſles belonging to Great Britain. It is a very ſmall, but very pleaſant iſland, ſo called by Columbus from its reſemblance to the famous mountain near Barcelona in Catalonia. It lies in W. Long. 61. 0. N. Lat. 16. 50. having Antigua to the north-eaſt, St Chriſtopher's and Nevis to the northweſt, and Guadaloupe lying ſouth ſouth-eaſt at the diſtance of about nine leagues. In its figure it is nearly round, about nine miles in extent every way, 27 in circumference, and is ſuppoſed to contain about 40,000 or 50,000 acres. The climate is warm, but leſs ſo than in Antigua, and is eſteemed very healthy. The ſoil is mountainous, but with pleaſant valleys, rich and fertile, between them; the hills are covered with cedars and other fine trees. Here are all the animals as well as vegetables and fruits that are to be found in the other iſlands, and not at all inferior to them in quality. The inhabitants raiſed formerly a conſiderable quantity of indigo, which was none of the beſt, but which they cut four times a-year. The preſent product is cotton, rum, and ſugar. There is no good harbour, but three tolerable roads, at Plymouth, Old Harbour, and Ker's bay, where they ſhip the produce of the iſland. Public affairs are adminiſtered here as in the other iſles, by a lieutenant-governor, council, and aſſembly, compoſed of no more than eight members, two from each of the four diſtricts into which it is divided. The wonderful effects of induſtry and experience in meliorating the gifts of nature have been no where more conſpicuous than in theſe iſlands, and particularly in this, by gradually improving their produce, more eſpecially of late years, ſince the art of planting hath been reduced to a regular ſyſtem, and almoſt all the defects of ſoil ſo thoroughly removed by proper management and manure, that, except from the failure of ſeaſons, or the want of hands, there is ſeldom any fear of a crop. In 1770 there were exported from this iſland to Great Britain 167 bags of cotton, 1670 l.; 740 hogſheads of rum, 7400 l. To Ireland 133 ditto, 1330 l.; 4338 hogſheads 232 tierces 202 barrels of ſugar, 79,507 l.; in the whole 89,907 l. To North America 12,633 l. There are a few ſhips employed in trading to this iſland from London and from Briſtol. As to the number of inhabitants, according to the moſt probable accounts, they conſiſt of between 1200 and 1500 whites, and from 10,000 to 12,000 negroes, though ſome ſay not ſo many.

MONUMENT, in architecture, a building deſtined to preſerve the memory, &c. of the perſon who raiſed it, or the perſon for whom it was raiſed; ſuch are a mauſoleum, a triumphal arch, a pyramid, &c.

MOOD, or Mode. See Mode.

Moods of Syllogiſm. See Logic nº 85.

Mood, or *Mode*, in grammar, the different manner of conjugating verbs. See Grammar.

MOON, (*Luna*, ☽), in aſtronomy, one of the heavenly bodies, uſually ranked among the planets; but with more propriety accounted a ſatellite, or ſecondary planet.

Among the ancients, the moon was an object of prime regard.—By the *Hebrews* ſhe was more regarded than the ſun, and they were more inclined to worſhip her as a deity. The new moon, or firſt days of every month, were kept as feſtivals among them, which were celebrated with ſound of trumpets, entertainments, and ſacrifice. (See Numb. xxviii. 11. x. 16. 1 Sam. xx. 5—18.) People were not obliged on theſe days to reſt. The feaſts of new moons were a miniature repreſentation of the feaſt of trumpets, which was held on the firſt of the month Tiſri, which was the beginning of the civil year. The Jews not being acquainted with the phyſical cauſe of eclipſes, looked upon them, whether of ſun or moon, as ſigns of the divine diſpleaſure. The Grecians looked upon the moon as favourable to marriage; and the full moons or the times of conjunction of ſun and moon, were held the moſt lucky ſeaſons for celebrating marriages; becauſe they imagined the moon to have great influence over generation. The full moon was held favourable for any undertakings by the Spartans: And no motive could induce them to enter upon an expedition, march an army, or attack an enemy, till the full of the moon. The moon was ſuppoſed both by Greeks and Romans to preſide over child-birth.—The patricians at Rome wore a creſcent on their ſhoes to diſtinguiſh them from the other orders of men. This creſcent was called *Lunula*. Some ſay it was of ivory. others that it was worked upon the ſhoe, and others that it was only a particular kind of fibula or buckle.

As all the other planets move primarily round the ſun, ſo does the moon round the earth: her orbit is an ellipſis, in which ſhe is retained by the force of gravity; performing her revolution round the earth, from change to change, in 29 days, 12 hours, and 44 minutes, and round the ſun with it every year: ſhe goes round her orbit in 27 days, 7 hours, 43 minutes, moving about 2290 miles every hour; and turns round her axis exactly in the time that ſhe goes round the earth, which is the reaſon of her keeping always the ſame ſide towards us; and that her day and night taken together are as long as our lunar month.

The mean diſtance of the moon from the earth is $60\frac{1}{2}$ ſemi-diameters of the earth; which is equivalent to 240,000 miles. The mean eccentricity of her orbit is $\frac{55}{1000}$ of her mean diſtance, or in miles 13,000, which makes a conſiderable variation in that mean diſtance. —Her diameter is to that of the earth as 100 to 365, as 11 to 40. 15, or 2180 miles: its mean apparent diameter is 31 minutes $16\frac{1}{2}$, and that of the ſun 32 minutes 12 ſeconds. Its mean diameter as ſeen from the ſun is 6 ſeconds.

The moon's ſurface contains 14,898,750 ſquare miles, and its ſolidity 5,408,246,000 cubical ones. The denſity of the moon's body is to that of the earth as 48,911 to 39,214; to that of the ſun, as 48,911 to 10,000; its quantity of matter to that of the earth, nearly as 1 to 39.15: the force of gravity on its ſurface is to that on the ſurface of the earth as 139.2 to 407.8; and the moon's bulk to that of the earth as $\frac{1}{50}$ to 1. The moon has ſcarce any difference of ſeaſons; becauſe her axis is almoſt perpendicular to the ecliptic.

The different appearances of the moon are very numerous; ſometimes ſhe is increaſing, then waning; ſometimes horned, then ſemicircular; ſometimes gibbous, then full and round. Sometimes, again, ſhe illumines us the whole night; ſometimes only a part of it; ſometimes ſhe is found in the ſouthern hemiſphere, ſometimes in the northern; all which variations having been firſt obſerved by Endymion, an ancient Grecian who watched her motions, ſhe was fabled to have fallen in love with him. The ſource of moſt of theſe appearances is, that the moon is a dark, opaque, and ſpherical body, and only ſhines with the light ſhe receives from the ſun; whence only that half turned towards him, at any inſtant, can be illuminated, the oppoſite half remaining in its native darkneſs. The face of the moon viſible on our earth, is that part of her body turned towards the earth; whence, according to the various poſitions of the moon, with regard to the ſun and earth, we obſerve different degrees of illumination; ſometimes a large and ſometimes a leſs portion of the enlightened ſurface being viſible.—But for a particular account of the nature, phenomena, &c. of this ſecondary but intereſting planet, ſee ASTRONOMY-*Index*, at *Moon*.

New Obſervations on the atmoſphere, Twilight, &c. of the MOON. M. Schroeter of the Royal Society of Gottingen has lately publiſhed a very curious and elaborate work in German, intitled *Selenotopographiſche Fragmente*, &c. or Selenotopographical Fragments, intended to promote a more accurate knowledge of the Moon's ſurface. The ſeveral maps of the moon *, which have been delineated by Hevelius, Ricciolus, Caſſini, and Mayer, are well known to every perſon converſant with aſtronomical ſubjects. It is evident that theſe delineations can give only a very general idea of the ſpots, together with their relative poſition on the lunar diſk; and as, with reſpect to us, the appearance of theſe muſt vary according to the direction in which the rays of the ſun fall on them, the moon's ſurface will not exactly correſpond with the repreſentation of it laid down in the map, except when it happens to be illuminated under the ſame angle as when this map was drawn. This conſideration induced the author to apply himſelf to the invention of a more accurate mode of deſcribing theſe phenomena than had hitherto been attempted. For this purpoſe having provided himſelf with a teleſcope ſeven feet in length conſtructed by Dr Herſchel, he reſolved, repeatedly and under various angles of illumination, to obſerve and delineate very ſmall portions of the lunar diſk; in order that, by comparing his different drawings of the ſame objects, he might compile an accurate, topographical deſcription of the moon's ſurface; but, in this manner, to form a complete lunar atlas, was an undertaking too extenſive for a ſingle perſon. He therefore found himſelf obliged to preſcribe more narrow limits to his deſign, and confined his plan to the delineation of the ſeveral portions of the moon's ſurface under one angle only of illumination, and this a very ſmall one, that he might obtain more diſtinct and accurate obſervations and drawings of the ſhadows; intending at the ſame time to examine ſuch parts as appeared either more remarkable or leſs diſtinct than the reſt, by repeated obſervations under various angles of illumination: And the preſent volume contains the reſult of his obſervations, with reſpect to the northern parts of the lunar diſk,

The author obſerves, that, through a teleſcope which magnifies a thouſand times, a lunar object of 160 feet in ſurface appears like a very ſmall point: and that, to be diſtinguiſhable with reſpect to ſhape, it muſt not be leſs than 800 feet in extent. He tells us, that for his obſervations he preferred thoſe times when the ſun's rays fell on the moon under the leaſt angle; that he carefully and repeatedly examined every object that could be diſtinguiſhed, and either actually meaſured its apparent diameter and the length of its ſhadow, or compared theſe dimenſions with others which he had already meaſured, and that he never uſed magnifiers of greater power than what was abſolutely neceſſary to render the object diſtinct. In order to facilitate the delineation, he applied to his teleſcope a projecting micrometer, divided into ſmall ſquares, which, by means of a braſs rod, could be placed at any diſtance from the eye, and always be kept parallel to the line of the moon's horns. His maps or drawings are orthographical projections: and his ſcale is ſo conſtructed, that 20 ſeconds of the moon's diſk correſpond with half an Engliſh inch on the map; thus the ſpace of 4 ſeconds is repreſented in the compaſs of a decimal line, and, according to M. Schroeter's computation, anſwers to a German mile or 3807 toiſes. The inconveniencies and inaccuracy of the common method of meaſuring the lunar mountains, induced him to contrive others capable of greater exactneſs and more general application: theſe he varied as the circumſtances of the caſe required; but they are all trigonometrical calculations of the heighth of the mountain, or the depth of the cavity from the angle of illumination and from the length of the ſhadow.

If, as ſome have ſuppoſed, a great part of the moon's ſurface be volcanic, it is natural to expect that the marks of eruption ſhould from time to time be diſcernible. A ſingle inſtance of this kind occurred to our author: ever ſince the 27th of Auguſt 1788, he had conſtantly ſeen a cavity, or, as he terms it, a *volcanic crater*, in the ſpot Hevelius, which he had never before perceived, though he had often examined this part of the moon with the utmoſt attention, and in the moſt favourable circumſtances. According to his conjectures, this phenomenon muſt have commenced between the 24th of October 1787 and the 27th of Auguſt 1788.

He obſerved ſome alterations in the appearance of lunar objects, which, though too conſiderable to be attributed to the variation of light, were not ſufficiently permanent to be conſidered as the effect of volcanoes. Theſe he aſcribes to meteors; for though he does not ſuppoſe the moon to be ſurrounded with air, exactly like that which inveſts our globe, he thinks it probable that it may have an atmoſphere of ſome kind, in which ſome of the elements of bodies. decompounded on its ſurface, may be ſuſpended; and that ſome of the lunar mountains may emit nebulous vapours, not unlike the ſmoke of our volcanoes, which obſcure and diſguiſe the objects ſeen through them.

In regard to thoſe bright points, which have been ſeen on the moon's ſurface during eclipſes, and at other times on her unenlightened part, and which ſome have ſuppoſed to be burning volcanoes; Schroeter, after the moſt attentive examination of them, imagines that moſt of them muſt be aſcribed to the light reflected from the earth to the dark part of the moon's diſk, which returns it from the tops of its mountains, under various angles, and with different degrees of brightneſs. Some of theſe phenomena he ſuſpects to be no more than optical illuſions, ariſing from igneous meteors floating in our atmoſphere, which happen to fall within the field of the teleſcope.

But the moſt intereſting part of this work conſiſts of the author's "Remarks on the Formation and phyſical Conſtitution of the Moon's Surface and Atmoſphere."

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* See ASTRONOMY-Index, at Moon.

The ſurface of the moon appears to be much more unequal than that of our earth; and theſe inequalities have great variety both in form and magnitude. There are large irregular plains, on which are obſerved long and narrow ſtrata of hills running in a ſerpentine direction; ſome of the mountains form extenſive chains; others, which are in general the higheſt, ſtand alone, and are of a conical ſhape: ſome have craters; others form a circular ring incloſing a plain; and in the centre of many of theſe plains, as well as in the middle of ſome of the craters, other mountains are found, which have likewiſe their craters. Theſe mountains are various with reſpect to colour, ſome being much darker than others.

The moſt lofty mountain on the ſurface of our globe is ſuppoſed to be Chimboraco, which is not 20,000 feet in height: but there are many in the moon which are much higher; that which is diſtinguiſhed by the name of *Leibnitz*, is not leſs than 25,000 feet. This elevation will appear more extraordinary, if compared with the moon's diameter, of which it is $\frac{1}{214}$th, whereas Chimboraco is not above $\frac{1}{1047}$th of that of the earth; thus conſidered, the lunar mountains are near five times as high as any on our globe.

The craters of the moon are circular, and ſurrounded with an annular bank of hills; they are remarkable for their width, many of them being from 4 to 15 geographical miles in diameter: ſome are not deeper than the level of the moon's ſurface; others are 9000, 12,000, and 15,000 feet in depth: that of one, which our author calls *Bernouilli*, is above 18,000 feet. The height of the annular bank is ſeldom equal to the depth of the crater which it ſurrounds; but the quantity of matter in the one appears to be in general nearly equal to the capacity of the other. The principal mountains and cavities ſeem to be connected by a ſeries of others of leſs magnitude; and ſometimes by hilly ſtrata, which, like the radii of a circle, may be traced to a common centre; this is generally either a mountain or crater, though not of the greateſt height or depth. Theſe hilly ſtrata, which, through ſmaller teleſcopes, appear like veins on the moon's ſurface, have often been miſtaken for torrents of lava; none of which, M. Schroeter ſays, he could ever diſcover.

From all the preceding circumſtances, the author concludes, that whatever may have been the cauſe of the inequalities of the moon's ſurface, it muſt not only have operated with great violence, but alſo have met with great reſiſtance: which inclines him to think, that the ſubſtance of this planet muſt originally have been very hard and refractory. He is of opinion that theſe mountains and cavities muſt have been produced in conſequence of ſome great revolution occaſioned by the action of a force directed from the centre towards the ſurface, and in this reſpect ſimilar to that which gave birth to our volcanoes: but he obſerves, that we have no reaſon to ſuppoſe it abſolutely volcanic, nor that it originated from fire. In ſome places, this force has only elevated the ſurface, and thus formed hills and mountains; in others, the ground has yielded to its violence, and has either been thrown up as a bank round the crater thus formed, or elſe falling into other cavities, has in part filled them up; after having exerted its greateſt violence in theſe mountainous accumulations, it has diffuſed itſelf in various directions, and produced the hilly ſtrata which are obſerved to diverge from them, like the radii of a circle from the centre. In ſupport of this hypotheſis, it is alleged, that the largeſt craters have the leaſt depth, and that in the deepeſt there is the moſt equal proportion between the capacity of the crater and the volume of the annular bank around it; but beſide the grand revolution here ſuppoſed, M. Schroeter is of opinion that there have been others of later date and leſs extent; to theſe he aſcribes the formation of ſecondary mountains, which ariſe either from the middle of the craters of the primary, or from the centre of a plain ſurrounded by a circle of hills? many of theſe have alſo craters, and, like the primary mountains, are connected by a ſeries of cavities and hilly ſtrata, that mark the progreſs of the cauſe by which they were produced. The new crater diſcovered by our author in the ſpot Hevelius, together with other circumſtances here enumerated, ſeem to indicate that the ſurface of the moon is far from being permanently ſettled and quieſcent.

The author's obſervations confirm the opinion that the cavities viſible on the lunar ſurface do not contain water; hence he concludes, that there can be no extenſive ſeas and oceans, like thoſe which cover a great part of the earth: but he allows that there may be ſprings and ſmall rivers. The queſtion, whether the moon be inhabited? is not omitted by M. Schroeter, who obſerves, that though it be not adapted to beings organiſed as we are, this is no proof that it may not be peopled with intelligent agents, endued with bodily conſtitutions ſuitable to the nature and economy of the planet for which they are deſtined.

With regard to a lunar atmoſphere, the exiſtence of which has been a ſubject of much diſpute *, our author adduces a variety of proofs in ſupport of the affirmative ſide of the queſtion. He alſo makes a number of obſervations on ſeveral of its relative properties, compared with the ſame in our atmoſphere; ſuch as its greater dryneſs, rarity, and clearneſs, which, however, do not prevent its refracting the ſolar rays, having pointed out the circumſtance, that the mountains in the dark hemiſphere of the moon, near its luminous border, which are of ſufficient height to receive the light of the ſun, are the more feebly illuminated the more diſtant they are from that border; from which proofs of a refracting atmoſphere, he alſo deduced the probability of the exiſtence of a faint twilight, though his long ſeries of obſervations had not yet fully evinced it.—He had however, aſcertained the exiſtence of a twilight on Venus; and as one fortunate diſcovery often leads to another, he had no ſooner ſucceeded in his obſervations on that planet, than he was induced to direct his attention, for a ſimilar purpoſe, to the moon, In doing this, he applied the calculations and inferences he there made to ſome appearances he had already noticed on this ſatellite. It occured to him, that if in fact there were a twilight on the moon, as there is on Venus and our earth, it could not, conſidering the greater rarity of its atmoſphere, be ſo conſiderable: that the veſtiges of it, allowing for the brightneſs of the luminous part of the moon, the ſtrong light that is thence thrown upon the field of the teleſcope, and in ſome meaſure the reflected light of our earth, could only be traced on the limb, particularly

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* See Astronomy-Index, at

Moon.

cularly at the cuſps; and even this only at the time when our own twilight is not ſtrong, but the air very clear, and when the moon, in one of its leaſt phaſes, is in a high altitude, either in the ſpring, following the ſun two days after a new moon; or in the autumn, preceding the ſun in the morning, with the ſame aſpect: in a word, that the projection of this twilight will be the greater and more perceptible the more falcated the phaſe, and the higher the moon above the horizon, and out of our own twilight.

All the requiſite circumſtances do not often coincide. M. Schroetor, however, was ſo fortunate as to be favoured with a combination of them on the 24th of February 1792: And the obſervation proved in every reſpect ſo complete, and the inferences deducible from it appeared to him ſo new and intereſting, that he could not with-hold the immediate communication of it from the public. His obſervations concerning both the Moon and Venus have been accordingly detailed in a paper ſent to the Royal Society of London, and inſerted in their Tranſactions for 1792; from which the following reſpecting the Moon are extracted.

“ On the abovementioned evening, at $5^h 40'$, two days and 12 hours after the new moon, when in conſequence of the libration the weſtern border of the grey ſurface of the Mare Criſium was $1'$-$20''$ diſtant from the weſtern limb of the moon, the air being perfectly clear, I prepared my ſeven-feet reflector, magnifying 74 times, in order to obſerve the firſt clearing up of the dark hemiſphere, which was illuminated only by the light of our earth, and more eſpecially to aſcertain whether in fact this hemiſphere, which, as is well known, is always ſomewhat more luminous at the limb than in the middle, would emerge out of our twilight at many parts at once, or firſt only at the two cuſps. Both theſe points appeared now, moſt diſtinctly and decidedly, tapering in a very ſharp, faint, ſcarce any where interrupted, prolongation; each of them exhibiting, with the greateſt preciſion, its fartheſt extremity faintly illuminated by the ſolar rays, before any part of the dark hemiſphere could be diſtinguiſhed. But this dark hemiſphere began ſoon after to clear up at once at its border, though immediately only at the cuſps, where, but more particularly at their points, this border diſplayed, on both at the ſame time, a luminous margin, above a minute in breadth, of a very pale grey light, which, compared with that of the fartheſt extremities of the cuſps themſelves, was of a very different colour, and relatively as faint as the twilight I diſcovered on the dark hemiſphere of Venus, and that of our own earth, when compared with the light immediately derived from the ſun. This light, however, faded away ſo gradually towards the eaſt, as to render the border on that ſide perfectly undefined, the termination loſing itſelf imperceptibly in the colour of the ſky.

“ I examined this light with all poſſible care, and found it of the ſame extent at both points, and fading away at both in the ſame gradual proportion. But I alſo, with the ſame caution, explored whether I could diſtinguiſh any part of the limb of the moon farther towards the eaſt; ſince, if this crepuſcular light had been the effect of the light reflected from our globe, it would undoubtedly have appeared more ſenſibly at the parts moſt remote from the glare of the illuminated hemiſphere. But, with the greateſt exertion of my viſual powers, I could not diſcover any part of the, as yet, wholly darkened hemiſphere, except one ſingle ſpeck, being the ſummit of the mountainous ridge Leibnitz, which was then ſtrongly illuminated by the ſolar light: and indeed eight minutes elapſed before the remainder of the limb became viſible; when not only ſeparate parts of it, but the whole, diſplayed itſelf at once.

“ This alone gave me certain hopes of an ample recompence and ſatisfied me that the principles I had laid down in my Selenotop. Fragm. § 525. *et ſeq.* concerning the atmoſpheres of the planets, and eſpecially of the moon, are founded on truth. But a ſimilar obſervation made on the 6th, after ſeven o'clock, afforded me ſeveral collateral circumſtances, which ſtrongly corroborate what I have there advanced on this ſubject. The whole limb of the dark hemiſphere, illuminated only by the reflected light of our globe, appeared now ſo clear and diſtinct, that I could very readily diſcern not only the large but alſo the ſmaller ſpots, and among theſe Plato, Ariſtarchus, Menelaus, Manilius, Copernicus, &c. and even the ſmall ſpeck to the north-weſt of Ariſtarchus, marked *b*, Tab. XXVII. fig. 1. of the Fragments. I could apply the uſual power, magnifying 161 times; and had full leiſure, and the means, to examine every thing carefully and repeatedly, and to take very accurate meaſurements.

“ Although a juſt idea of ſo delicate a phenomenon as this crepuſcular light cannot poſſibly be conveyed by a drawing, but muſt be gathered from actual inſpection, I have, nevertheleſs, attempted a delineation of it, and of the ſouthern and eaſtern cuſps, fig. 1, and 2. as deduced from my meaſurements, eſpecially at the ſouthern cuſp, in hopes thereby to render what I have farther to ſay concerning this obſervation the more intelligible.

Plate CCCXIV.

“ The ſouthern cuſp (fig. 1.) extended from *a* to *c*, with a gradually fading but ſtill reſplendent ſolar light, of its uſual pale yellow colour, and terminated at *c* with a mountain. That this was really the point of the cuſp, appears not only from the general conſtruction of the falcated ſegment, which was ſufficiently narrow even at its beginning *a*, near which it was ſomewhat diſfigured at *b* by a high mountain, but alſo from the narrowneſs of its luminous curve at *d e* and *f*, the breadth of which ſeldom exceeded $1''$, and had a ſenſible interruption ſo near as *d*. This curve was throughout, from *a* to *c*, except where the glare of the ſolar rays ſpread ſome degree of light, bordered with the pale aſh-colour of the dark hemiſphere, glimmering with the faint light reflected from our earth; out of which, however, roſe the higher mountains *g*, *h*, *i*, *c*, which were now already illuminated by the ſun; and farther on, not leſs than 30 lines, or, according to my uſual projection, two minutes diſtant from the point *c*, was ſeen another mountain *l*, which belonged to the high ridge Leibnitz, and alſo received its light immediately from the ſun.

“ There can hence be no doubt of the termination of the cuſp being at *c*; and this being well aſcertained, I now diſtinguiſhed with the greateſt certainty the twilight extending from *c* to *k*. The moſt remarkable circumſtances attending this light were, that it was broadeſt and brighteſt at *c*, and that it dwindled away and contracted toward, *l*, where it loſt itſelf in the faint glimmering of our terreſtrial light; and that at the northern cuſp (fig. 2.), at which there do not appear to be ſo many mountains and inequalities as at the ſouthern, this light exhibited the ſame pyramidal form, and was of equal length, and alike fading in intenſity and colour, as that at the ſouthern.

"This light, compared with that of the thinneſt and leaſt bright part of the cuſp *d c*, was as faint as the pale aſh-coloured ſpots in the luminous hemiſphere, when oppoſed to the bright ones. But this is ſtill better illuſtrated by a compariſon between the high mountain *l* (fig. 1.) which now already appeared illuminated by the ſolar light and the ſpot Ariſtarchus, which ſhone moderately merely with the light reflected from our globe. The ſaid mountain had, comparatively with the thin luminous arc *d e f* of the bright hemiſphere, and the mountains *g*, *h*, *i*, *c*, a very pale, fading, but yet brighter light than Ariſtarchus, as indeed might have been expected from what I ſaid in my Selenotop. Fragm.; but this reflected light upon Ariſtarchus was, however, ſenſibly brighter than the glimmering light from *c* to *k*. And, reſpecting the ſtill fainter terreſtrial light which bordered the luminous curve from *c* to *k* (fig. 1. and 2.), I cannot give a better idea of it than by obſerving, that the light at the extremities of both the cuſps appeared of a pyramidal form, ſimilar to, but though gradually fading, and very undefined, yet brighter than that of our zodiacal light, when, in the months of March and April, it blends itſelf, comparatively with the remaining colour of the ſky, with the terreſtrial light, terminating in a very ſharp point.

"The undefined and gradually fading appearance of this light was the cauſe that, though I had recourſe to a dark projection table I could not, however, take any accurate meaſurements of it. I found nevertheleſs, by repeated compariſons, that the length of this pyramidal glimmering light, in which I could perceive no ſenſible inequality at the limb of the moon, amounted to about $\frac{2}{3}$ of the diſtance between the two mountains *c*, *l*, (fig. 1.) which ſhone with the ſolar light. Comparing alſo this ſouthern twilight with the northern, it appeared of the ſame length; and, on meaſuring the diſtance *c l*, I found it repeatedly $= 30$ lines $= 2'$; ſo that the length of the twilight muſt have amounted to 20 lines $= 1'\ 20''$. Its greateſt breadth at *c* could, on the other hand, becauſe of the extent and greater denſity of its light, be eaſily aſcertained by means of the immediate application of the projection tables. This meaſurement gave at moſt $\frac{2}{3}$ of a line, or full $2''$.

"Although I be poſitively certain of this very remarkable appearance at both cuſps, and of its perfect ſimilarity, in all my obſervations, I could not, however, trace any veſtige of a like crepuſcular light at any other part of the terminating border: nor could I on the very next evening, being the 25th, and alſo on the 26th of February, perceive, even at the cuſps, any of the twilight I expected to ſee there; the very thin, faint, luminous line, which did indeed appear on the 26th, at the ſouthern cuſp between *a* and *b*, (fig. 3.), being undoubtedly the effect of the immediate ſolar light, probably illuminating ſome prominent, flat area, as yet ſituated in the dark hemiſphere.

"Thus far the obſervations: and now for the application of them.

"I need hardly inſiſt upon the proofs, that the very faint pyramidal glimmering light obſerved on the 24th of February at the extremities of both cuſps, could by no means be the immediate effect of the ſolar light, all the circumſtances of the obſervations militating uniformly and decidedly againſt this ſuppoſition, which, were it true, would oblige us to admit a moſt unaccountable diminution of light, and thence alſo a denſity of the lunar atmoſphere, that ought to exceed even the denſity of ours; a fact abſolutely contradicted by all the lunar obſervations hitherto made. This light, indeed, was ſo very faint, that it diſappeared at $7^h\ 20'$, when the moon approached the horizon; whilſt, on the other hand, Ariſtarchus, which had no light but what it received from the earth, was ſtill very diſtinguiſhable; and the ſummit of Leibnitz *l*, fig. 1. (which, though far within the dark hemiſphere, was, however, illuminated by the immediate ſolar rays) diſplayed a degree of brightneſs, which, although when compared with that of the cuſp *d e f*, it appeared very faint and dwindling, equalled, however, that of our Peak of Teneriff. Nor can it be conceived why this glimmering light broke off ſo ſuddenly at both the cuſps, without a progreſſive diminution. It can hardly be ſuppoſed, that ſimilar, grey, prominent, flat areas, of the ſame form and dimenſions, and comparatively of a faint light, which, whilſt in the dark hemiſphere, they derive immediately from the ſun, exiſt on all parts of the moon; more eſpecially as, at the places obſerved, the limb happened to exhibit throughout an exact ſpherical form, without the leaſt ſenſible inequality; and as in both the bordering regions of the northern and ſouthern hemiſpheres, eſpecially in the latter, no ſuch grey prominent planes are any where diſcernible. It may then be aſked, why did this faint glimmering light appear at both cuſps, along equal arcs of the limb, of equal length and breadth, and of the ſame pyramidal form? and why did its farther extremity blend itſelf with the terreſtrial light of the dark hemiſphere, which, according to a great number of my ſelenotopographic obſervations, is by no means the caſe, even with thoſe grey prominent areas, which, being at ſome diſtance on the dark ſide of the terminating border, are nevertheleſs illuminated immediately by the ſun?

"Theſe, therefore, could certainly not derive their light immediately from the ſun; whence this appearance, like the ſimilar ones on the planet Venus, can only be aſcribed to the ſolar rays reflected by the atmoſphere of the moon upon thoſe planes, producing on them a very faint, gradually diminiſhing, glimmering light, which at laſt loſes itſelf in the reflected terreſtrial light, in the ſame manner as our twilight blends itſelf with the light of the moon. Every circumſtance of the above obſervation ſeems to me to confirm this ſuppoſition; and hence the obſervation itſelf, which, though ſingle, was however a moſt fortunate and complete one, muſt appear of no ſmall degree of importance, ſince it not only confirms the obſervations and inferences on the long conteſted lunar atmo-

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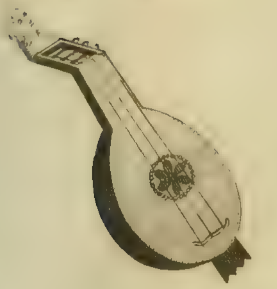
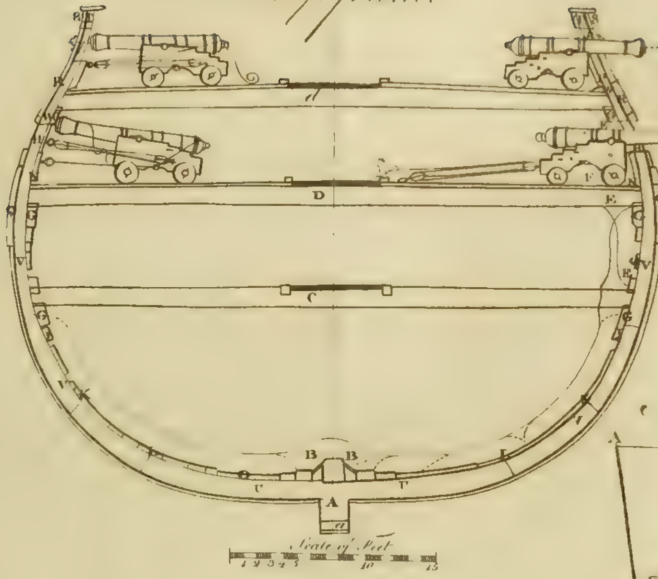


Midship frame



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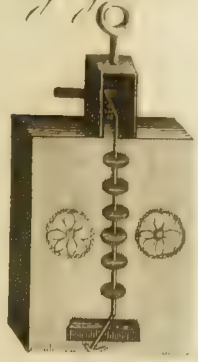
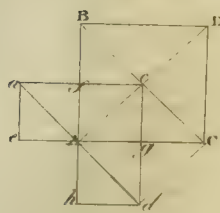
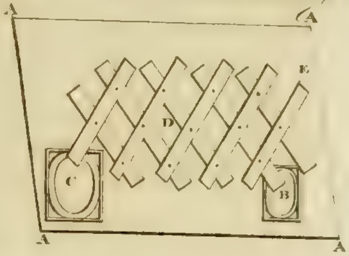


Motion



Miniature Painting



Moon

Fig. 1.

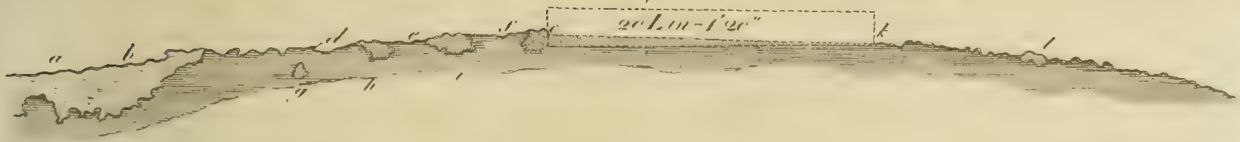


Fig. 2.

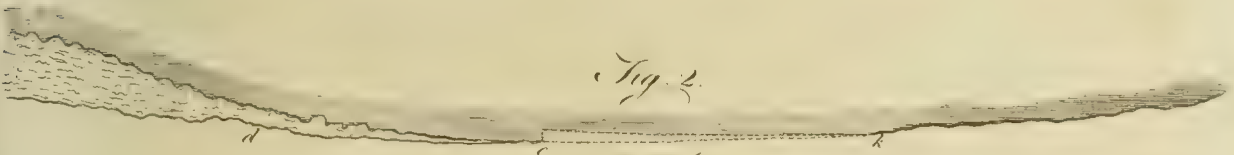


Fig. 3

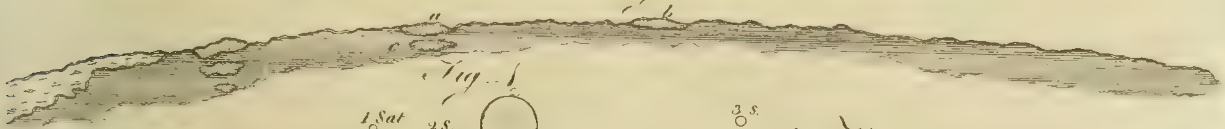


Fig. 4

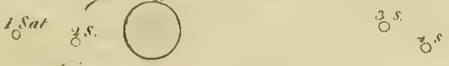
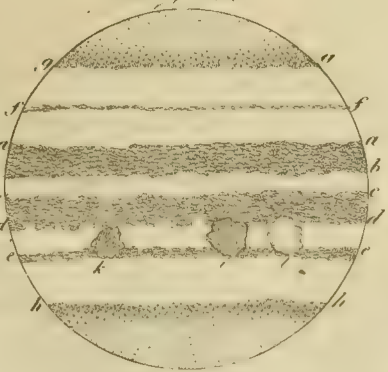


Fig. 5.



North

Fig. 6.

Aristarchus

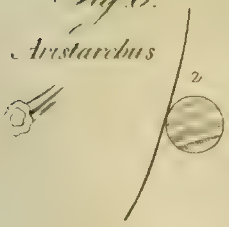
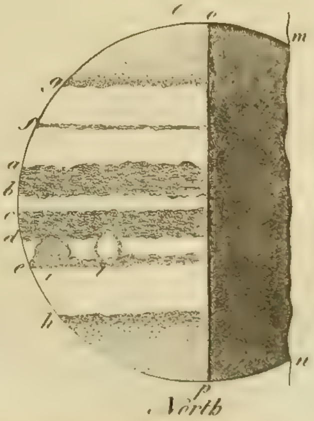
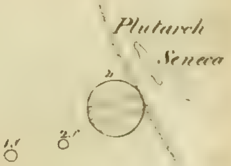


Fig. 8.



North

Fig. 7.



R. Scot & S. Mardier

atmoſphere contained in my Selenotop. Fragm. but alſo furniſhes us with many more lights concerning the atmoſphere of planets in general than had been afforded us by all thoſe obſervations collectively."

This, and the mathematical certainty that the phenomenon is in fact nothing but a real twilight in the lunar atmoſphere, he farther evinces by a ſeries of theoretical deductions and calculations, which do not admit of being here ſtated. Among other reſults, it appears, that the lower and more denſe part of the lunar atmoſphere, that part, namely, which has the power of reflecting this bright crepuſcular light, is only 1356 Paris feet in height; and hence it will eaſily be explained how, according to the different librations of the moon, ridges of mountains, even of a moderate height, ſituated at or near the terminating border, may partially interrupt, or at times wholly prevent, this crepuſcular light, either at one or the other cuſp, and ſometimes at both. "I cannot hence (ſays our author) but conſider the diſcovery I here announce as a very fortunate one, both as it appears to me deciſive, and as it may induce future obſervers to direct their attention to this phenomenon. Admitting the validity of this new obſervation, which I think cannot well be called in queſtion, I proceed now to deduce from it the following inferences.

"1. It confirms, to a degree of evidence, all the ſelenotopographic obſervations I have been ſo ſucceſsful as to make on the various and alternate changes of particular parts of the lunar atmoſphere. If the inferior and more denſe part of this atmoſphere be in fact of ſufficient denſity to reflect a twilight over a zone of the dark hemiſphere 2° 34′, or 10¾ geographical miles in breadth, which ſhall in intenſity exceed the light reflected upon its dark hemiſphere by the almoſt wholly illuminated diſk of the earth; and if, by an accidental computation, this denſe part be found to meaſure 1356 feet in perpendicular height, it may, according to the ſtricteſt analogy, be aſſerted, that the upper, and gradually more rarified ſtrata, muſt, at leaſt, reach above the higheſt mountains in the moon. And this will appear the more evident, if we reflect, that notwithſtanding the inferior degree of gravitation on the ſurface of the moon, which Newton has eſtimated at ſomewhat leſs than one-ſixth of that on our earth, the lower part of its atmoſphere is neverthele ſs of ſo conſiderable a denſity, This conſiderable denſity will, therefore, fully account for the diminution of light obſerved at the cuſps, and on the high ridges Leibnitz and Doerfel, when illuminated in the dark hemiſphere; as alſo for the ſeveral obſcurations and returning ſerenity, the eruptions, and other changes, I have frequently obſerved in the lunar atmoſphere. This obſervation alſo implies:

"2. That the atmoſphere of the moon is, notwithſtanding this conſiderable denſity, much rarer than that of our earth. And this indeed is ſufficiently confirmed by all our other lunar obſervations. I think I may aſſert, with the greateſt confidence, that the clearer part of our twilight, when the ſun is 4° below our horizon, and when we can conveniently read and write by the light we receive from it, ſurpaſſes conſiderably in intenſity the light which the almoſt wholly illuminated diſk of our earth reflects upon the dark hemiſphere of the moon 2½ days before and after the new moon. But ſhould we even admit an equal degree of intenſity, it will, however, appear from computation, that our inferior atmoſphere, which reflects as ſtrong a light over 4° as that of the moon does over 2° 34′ of their reſpective circumferences, muſt be at leaſt eight times higher than that of the moon.

"3. The ſtriking diminution of light I noticed in my twelve years obſervations on Venus, likewiſe indicates, that the atmoſphere of that planet, which is in many reſpects ſimilar to ours, is much denſer than that of the moon; and this will be ſtill farther corroborated, if we compare together the ſeveral meaſurements and computations made concerning the twilights of different planets. There is no doubt but that the fainteſt twilight of Venus, as ſeen either before or after the riſing and ſetting of the ſun acroſs our twilight, is much brighter than that of the moon; and it appears, moreover, from computation, that the denſer part of the atmoſphere of Venus meaſures at leaſt 15000 Paris feet in height, and ſpreads its twilight 67 geographical miles into the dark hemiſphere, whilſt the denſer part of the lunar atmoſphere, whoſe height does not exceed 1356 feet, produces a faint twilight not above 10¾ geographical miles in breadth. Thus, as my ſucceſsful obſervations on the twilight of Venus led me to the diſcovery of that of the moon, ſo did theſe latter reciprocally confirm the former: and thus, which ever way we contemplate the ſubject, muſt we be ſtruck with the coincidence that prevails throughout.

"4. But if the lunar atmoſphere be comparatively ſo rare, it follows, that the inflection of light produced by it cannot be very conſiderable; and hence does the computation of M. du Sejour, according to which the inflection of the ſolar rays which touch the moon amounts to no more than 4½″, receive an additional degree of authenticity *. Beſides which,

"5. As the true extent of the brighteſt lunar twilight amounts to 2° 34′, the obliquity of the ecliptic in the moon only to 1° 29′; the inclination of the orbit of the moon, on the contrary, to 5° 15′, and its ſynodic period, during which it performs a revolution round its axis is = 29d. 12h; it follows, that its brighteſt twilight, to where it loſes itſelf in the light reflected by the almoſt fully illuminated diſk of our earth, muſt, at leaſt at its nodes, laſt 5h. 3′, and that it will be ſtill longer at other parts of the orbit, according to the ſituation of the nodes.

"6. And laſtly, it being a well known fact † that the fixed ſtars, as they approach the moon, diminiſh in ſplendor at the moſt only a very few ſeconds before their occultations, it was natural for me, after the ſucceſsful obſervations I had made on the twilight of the moon, to pay particular attention to this circumſtance. On the 25th of February, at 6h. P. M. the ſky being very clear, the limb of the dark part of the moon appeared uncommonly diſtinct; and only a few ſeconds of a degree from its edge was ſeen a teleſcopic ſtar of about the 10th or 12th magnitude. I counted full 20″ before its occultation, and 18½ of theſe, without the leaſt perceptible diminution of light. The ſtar, however, began now gradually to fade, and after the remaining 1½′, during which I obſerved it with all poſſible attention, it vaniſhed in an inſtant. This obſervation agrees perfectly with the above computations

* De la Londe's Aſtron § 1992—1194.

† Selenot. Fragm. § 531.

putations. Although it be proved that the inferior denſe part of the lunar atmoſphere reflects a ſtronger light than that which the dark hemiſphere receives from an almoſt fully illuminated diſk of our earth; and although, conſidering the inferiority of gravitation on the ſurface of the moon, there be no doubt that this denſe part, together with the ſuperior gradually more rarified regions of its atmoſphere, muſt extend far above its higheſt mountains; it is yet a fact, that the breadth of this obſerved twilight, to where it loſes itſelf in our reflected terreſtrial light, does not meaſure more than 2° 34′: it is therefore highly probable, that its greateſt extent in the moſt favourable phaſes near our new moon can never exceed the double of the above arc, or 5° 8′; and hence we can only infer a perpendicular height of an atmoſphere, capable of inflecting the ſolar rays, which at moſt meaſures 5376 feet: nor is it very likely that, unleſs accidental and hitherto unknown circumſtances ſhould occaſionally condenſe different parts of this atmoſphere, theſe upper ſtrata ſhould materially affect the diſtinctneſs of a ſtar ſeen through it.

"But admitting the height of the atmoſphere, which may affect the brightneſs of a fixed ſtar, not to be leſs than 5376 feet, this will amount to an arc of only 0,94″, or not quite one ſecond; and as the moon deſcribes an arc of 1″ in 2″ of time, it follows, that in general the fading of a ſtar, which approaches to an occultation, cannot laſt quite 2″ in time; that if the appulſe be at a part of a limb of the moon where a ridge of mountains interferes, the gradual obſcuration will laſt a ſhorter time; and that it may, under ſome circumſtances of this nature, be even inſtantaneous."

To the foregoing obſervations, M. Schroter ſubjoins the following account of an occultation of Jupiter by the moon when near its full, which occurred to him by mere accident on the 7th of April 1792.

"The ſky being very ſerene, and Jupiter uncommonly bright, I prepared my ſeven-feet reflector, magnifying 74 times, in hopes that the ſtrong light and diſtinctneſs it afforded would enable me to compare the appearances of this phenomenon with the reſults which I had deduced from my late obſervations on the height and denſity of the atmoſphere of the moon.

Plate CCLXIV. "Fig. 4. repreſents the ſituation of Jupiter's four ſatellites, as they appeared, moſt diſtinctly, two of them to the weſtward, the ſecond about one, and the firſt near two of Jupiter's diameters diſtant from its limb; and the two others to the eaſtward, the third about ſeven, and the fourth near eight of the ſame diameters, diſtant from the ſaid limb.

"Fig. 5. ſhows Jupiter with its belts, and of a ſomewhat ſpheroidal form, as it now appeared to me, and as diſtinctly as I had ever ſeen it. The equatorial belt, from *a* to *d*, was very apparent. It conſiſted properly of two zones, *a b* and *c d*, of a browniſh-grey colour, with a more luminous interval *b c* between them. At *e* and *f* were two comparatively well defined ſtripes, which I had noticed for many years back, but which now croſſed the whole diſk; and the polar regions appeared again, from *g* and *h*, more dim and grey than the bright part of the planet. But what particularly ſtruck me, were two nebulous undefined ſpots, *i* and *k*, which were ſenſibly darker than the principal zone *d d*; and at *l* a ſtill more remarkable, circular, though imperfectly defined ſpot, ſomewhat brighter than the luminous interval between the zones, and perfectly ſimilar to the remarkable luminous ſpot which I had obſerved in 1786 and 1787 on the ſame part of Jupiter, and which then led me to ſome very unexpected inferences concerning the atmoſphere of that planet *.

"Theſe favourable circumſtances led me to the following accurate obſervation, which I was certain would prove inſtructive to me. At 10h. 40′ 50″ I ſaw the ſpot *i* at about the middle of its parallel; and immediately after began the occultation; than which a more diſtinct and beautiful one was perhaps never ſeen.

"*Immerſions.* The weſtern, preceding, firſt ſatellite, diſappeared behind the ſharp bright limb of the moon, at 10h. 43′ 12″.

The ſecond ſatellite diſappeared, without becoming at all indiſtinct, exactly at 10h. 44′ 19″.

The weſtern limb of Jupiter came in contact, moſt diſtinctly, with the eaſtern limb of the moon, at 10h. 46′ 32″,5.

Jupiter's eaſtern limb diſappeared, as diſtinctly, at 10h. 48′ 20″,5. This immerſion took place, as repreſented in fig 6. to the eaſtward of Ariſtarchus, at about the 25th degree of north latitude.

"The third ſatellite diſappeared, after having been for about one or two ſeconds faint and indiſtinct, at 10° 58′ 57″,5.

"The fourth ſatellite, which appeared the leaſt of them all, became undiſcernible near the limb, and vaniſhed at about 11h. 2′ 16″.

"*Emerſions.* The two preceding firſt and ſecond ſatellites were here likewiſe of uſe in determining preciſely the emerſion of both the limbs of Jupiter from the dark hemiſphere of the moon.

"The firſt appearance of Jupiter's weſtern limb was very diſtinct at 11h. 43′ 54″.

"Emerſion of the eaſtern limb, as diſtinct, at 11h. 45′ 39″, 5. This emerſion took place, as repreſented in fig. 7. to the north-eaſtward of Seneca (B. Tab. VIII. of the Frag.), at about the 23d degree of north latitude.

"The emerſion of the next, or third ſatellite, was not obſerved.

"That of the fourth was diſtinct at 11h. 59′ 1″.

"This obſervation gave me the more ſatisfaction, as it ſingularly contributed to confirm the diſcovery I had been ſo fortunate as to make of the twilight in the moon, and the height and denſity of the lower ſtratum of its atmoſphere.

"Experience has ſufficiently proved, that a ſtronger will ever obſcure a fainter light; and it follows hence, that the light of a bright ſtar approaching the moon, when full or nearly ſo, will loſe ſomething of its luſtre: but little can be inferred in favour of an atmoſphere either of the Moon or of Mars, from the obſervation of Caſſini; : in which, as Dr Herſchel has illuſtrated by ſome obſervations of his own*, a ſtar in Aquarius, of the ſixth magnitude, and as yet ſix minutes diſtant from Mars, diminiſhed in light when both were ſeen in the ſame field of the teleſcope. A mere apparent diminution of light, occaſioned by the glare of a larger luminous object, when ſeen at the ſame time with a ſmaller

* Beytr zu den neuſten Aſtron. Entd. p. 75 and Tab. I. fig. 6.

* Phil. Tranſ. 1784.

Moon. ſmaller one in the field of the teleſcope, is one thing; and another thing is a real indiſtinctneſs of the ſmall luminous body, which increaſes in proportion as they approach nearer to each other.

"It was very natural for Jupiter to diminiſh in brightneſs when it approached ſo near to the moon, then almoſt at its full, as to be ſeen at the ſame time in the field of the teleſcope, which was in fact the circumſtance of this obſervation: but I could not obſerve any progreſſive variation of light in the eaſtern and weſtern, equally luminous, diſks, proportional to their diſtances from the limb of the moon, much leſs a real indiſtinctneſs; and this neither when the limbs of the two planets were nearly in contact, nor when Jupiter was partly, or about one half covered by the moon.

"It was a ſight truly gratifying to an eye accuſtomed to the light of the moon, or in general to ſimilar obſervations, to behold how Jupiter, at its immerſion as well as emerſion, being half or more than half covered by the moon, exhibited its belts and other parts as diſtinctly cloſe to the limb of the moon as it does at ſome diſtance from it? and had I not already ſucceeded in numerous obſervations on the atmoſphere of the moon, and very recently in thoſe which enabled me to determine its twilight, I ſhould perhaps have adopted the doubts the ancient aſtronomers entertained concerning the exiſtence of a lunar atmoſphere; and this the rather, as when Jupiter in its immerſion was ſo far covered, that the luminous ſpot *l*, fig. 5. was cloſe to the moon, I could plainly diſtinguiſh this ſpot, although it be in itſelf by no means very perceptible.

"Such, however, muſt have been the appearances, according to my new obſervations and meaſurements of the twilight of the moon; for if it be proved, that the extent of this twilight, to where it loſes itſelf in the light reflected from the almoſt wholly illuminated diſk of our earth, amounts to no more than an arc of 2° 34′ of the circumference of the moon. and if it be hence demonſtrable, that its greateſt dilatation does barely amount to 5° 8′, and the perpendicular height of that part of the lower more condenſed ſtratum of its atmoſphere, which is capable of reflecting the ſolar rays, and of producing ſome other, perhaps more remarkable obſcurities in the ſtars ſeen through it, does not exceed 5000 Paris feet, and hence cannot reach above one ſecond of a degree above the limb of the moon: we need not wonder that ſo ſmall a magnitude which loſes itſelf in the inequalities of the limb, many parts of which are known to be conſiderably mountainous, ſhould not become ſenſible, eſpecially at the approach of a body of ſo large a diameter as Jupiter, and when ſo ſmall a magnifying power is applied. And thus may I with confidence aſſert a perfect coincidence between this and my many other obſervations.

"The appearance, fig. 8. when Jupiter, at the emerſion, the objects being particularly ſharp and diſtinct, came forth from behind the moon, which now covered no more than one quarter of its diameter, was truly ſplendid and ſatisfactory: and I muſt here particularly mention the circumſtance, that the part of the moon's dark hemiſphere, between its bright terminating edge *m n* and its out ward limb, bordering upon the emerging planet *op*, was particularly opaque and hence produced a very ſtriking effect.

"I omit entering here upon any further conſiderations; and ſhall conclude with obſerving, that, after the occultation was completely ended, the luminous ſpot *l* had at 12h. 1′ ſo far advanced in its parallel *d e* as to have reached to within $\frac{1}{6}$, or at moſt $\frac{1}{5}$, of its whole length of the weſtern limb: and that on the 28th of March, five days after a new moon; I obſerved an occultation of a very diſtinct, though teleſcopic, ſtar, by the dark hemiſphere of the moon; in which, agreeably to the above obſervation, not the leaſt gradual diminution of light or indiſtinctneſs could be perceived, the ſtar being ſeen to vaniſh on a ſudden."

Influence of the Moon *on the human body, the weather*, &c. The vulgar doctrine concerning the influence of the moon on the changes of *weather* is very ancient, and has gained credit among the learned without ſufficient examination; but it ſeems now to be pretty generally exploded by philoſophers, as equally deſtitute of all foundation in phyſical theory, and unſupported by any plauſible analogy. The common opinion is, that the lunar influence is exerted at the ſyzygies and quadratures, and for three days before and after each of theſe epochs. There are 24 days therefore, in each ſynodic month, over which the moon at this rate is ſuppoſed to preſide; and as the whole conſiſts but of 29 days 12 $\frac{3}{4}$ hours only $5\frac{1}{2}$ days are exempt from her pretended dominion. Hence, though the changes of the weather ſhould happen to have no connection whatever with the mooon's aſpects, and they ſhould be diſtributed in an equal proportion through the whole ſynodic month, yet any one who ſhall predict, that a change ſhall happen on ſome one of the 24 days aſſigned, rather than in any of the remaining $5\frac{1}{2}$, will always have the chances 24 to $5\frac{1}{2}$ in his favour. Men may, therefore, eaſily deceive themſelves, eſpecially in ſo unſettled a climate as ours. Moreover, the writers who treat of the ſigns of the weather, derive their prognoſtics from circumſtances which neither argue any real influence of the moon as a cauſe, nor any belief of ſuch an influence, but are merely indications of the ſtate of the air at the time of obſervation: ſuch are, the ſhape of the horns, the degree and colour of the light, and the number and quality of the luminous circles which ſometimes ſurround the moon, and ther circumſtances attending the diſappearance. (See the Διοσημεια of Aratus and the *Scholia* of Theon.) The vulgar ſoon began to conſider theſe things as cauſes: which had been propoſed to them only as ſigns: and the notion of the moon's influence on all terreſtrial things was confirmed by her manifeſt effect upon the ocean. See, on this ſubject, Phil. Tranſ. vol. lxv. part 2. p. 178. &c.

The famous Dr Mead was a believer in the influence of the ſun and *moon* on the *human body*, and publiſhed a book to this purpoſe, intitled *De Imperio Solis ac Lunæ in Corpore humano*: but this opinion has been exploded by moſt philoſophers as equally unreaſonable in itſelf, and contrary to fact. As the moſt accurate and ſenſible barometer is not affected by the various poſitions of the moon, it is not thought likely that the human body ſhould be affected by them. Several learned and ingenious men, however ſtill conſidered Dr Mead's doctrine as far from being unfounded.

Harveſt-Moon. It is remarkable, that the moon, during the week in which ſhe is full in harveſt, riſes, ſooner after ſun-ſetting than ſhe does in any other full moon week in the year. By doing ſo ſhe affords an immediate ſupply of light after ſun-ſet, which is very beneficial to the farmers for reaping and gathering in the fruits of the earth; and therefore they diſtinguiſh this full moon from all the others in the year, by calling it the *harveſt-moon*. For an account of which, ſee ASTRONOMY, n° 370, 371.

Moon-Eyes, in the manege. A horſe is ſaid to have moon-eyes when the weakneſs of his eyes increaſes or decreaſes according to the courſe of the moon; ſo that in the wane of the moon his eyes are muddy and troubled, and at new moon they clear up; but ſtill he is in danger of loſing his eye-ſight quite.

Moon-ſtone, a genus of ſiliceous earths, of a clear white colour approaching to that of milk, When looked at in a certain poſition, it reflects a ſtrong light like mother-of-pearl; in others, it ſhows ſpots of a carnation colour. It is found in pieces with obtuſe angles, ſometimes of a quadrangular figure. When broken, it appears evidently foliated. According to Werner it agrees in hardneſs and moſt other reſpects with felt-ſpar. He tells us, likewiſe, that it is probably the *androdamal* of Pliny, the common *giraſole* of the Italians, and the *water opa* of Ceylon. Sometimes, he tells us it is claſſed with the opal, and ſometimes with the cat's eye. According to M. Magellan, this ſtone is of the chalcedony or pſeudo-opal kind: it reflects a whitiſh light, with ſome various ſhades of few intermixed colours on a bluiſh bottom, like the face of the moon when high enough not to appear reddiſh by the interpoſition of earthy vapours. The iris, or rainbow-ſtone, ſeems to be no other than a moon-ſtone in which the yellow, purple, and blue rays are moſt conſpicuouſly reflected. When looked at, it appears of a reddiſh brown; but on holding it in the light of the ſun, we diſcover the figure of a rainbow. There are, however, ſeveral other ſtones which have the ſame appearance in the ſun's light.

Moon-wort in botany. Se LUNARIA.

MOOR (Sir Karel de), a capital painter of portraits, hiſtory, and converſations, was born at Leyden, in 1656: and at firſt was a diſciple of Gerard Douw, with whom he continued for a conſiderable time. He afterwards ſtudied ſucceſſively under Abraham Vanden Tempel, Francis Mieris, and Godfrey Schalcken. As ſoon as he began to follow his profeſſion, the public in a ſhort time did juſtice to his extraordinary merit; and he took the moſt effectual method to eſtabliſh his reputation, by working with a much ſtronger deſire to acquire fame than to increaſe his fortune. According to Mr Pilkington, he painted portraits in a beautiful ſtyle, in ſome of them imitating the taſte, the dignity, the force, and the delicacy of Vandyck; and in others, he ſhowed the ſtriking effect and ſpirit of Rembrandt. His pictures were always neatly and highly finiſhed; he deſigned them excellently, and grouped the figures of his objects with great ſkill, His works were univerſally admired; and ſome of the moſt illuſtrious princes of Europe ſeemed ſolicitous to employ his pencil. The grand duke of Tuſcany deſired to have the portrait of De Moor, painted by himſelf, to be placed in the Florentine gallery; and on the receipt of it, that prince ſent him in return a chain of gold and a large medal of the ſame metal. The imperial ambaſſador count Sinzendorf, by order of his maſter, engaged him to paint the portraits of Prince Eugene and the duke of Marlborough on horſeback; and in that performance, the dignity and expreſſion of the figures, and alſo the attitudes of the horſes, appeared ſo maſterly; that it was beheld with admiration, and occaſioned many commendatory poems in elegant Latin verſe to be publiſhed to the honour of the artiſt; and the emperor, on ſeeing that picture, created De Moor a knight of the holy Roman empire. He likewiſe had the honour to paint the portrait of Peter the great czar of Muſcovy; and an extraordinary number of other portraits, for which he received very large prices.—His hiſtorical paintings were admirable; although he moſt frequently was employed to paint in a large ſize, yet he often painted ſmall eaſel pictures, with ſubjects of hiſtory or converſations: and theſe are exceedingly valued, having all the merit of neat penciling and ſweet colouring added to an elegant taſte of deſign. He died in 1738.

MOOR, in country affairs, denotes an unlimited tract of land, uſually over-run with heath.

Moon-Cock, or *Gor-Cock*. See TERTAG.

Moon-Land, or *Moory ſoil*, in agriculture, is a black, light, and ſoft earth, very looſe, and without any admixture of ſtones; and with very little clay or ſand.

The uppermoſt ſtratum of the fen-lands is uſually of this earth, and it commonly conſtitutes a moderately thick or deep bed. Intermixed with water it cannot eaſily be worked up into a paſte: and when with labour worked up into ſomewhat of a firm maſs, its ſurface appears ſpongy and porous; and as ſoon as dry, it eaſily moulders away to powder.

It is uſually ſoft to the touch, unleſs it be worked very cloſely between the fingers; then it ſhows a mixture of a ſmall quantity of ſand, both to the touch and to the eye. It ſeems indeed to conſiſt almoſt entirely of pure vegetable matter; and this lying in ſuch plenty on the ſurface of the fen-lands is the cauſe of their being ſo very fertile.

The great diſadvantage of the places which have this ſoil, is their being liable to be glutted with wet; and to remedy the inconveniences ariſing from thence, the farmers who rent theſe land have a cuſtom of burning the ſoil at proper ſeaſons. It burns very freely and eaſily, the ſurface readily catching flame: and a ſubſtance ſomewhat bituminous, uſually contained among the ſoil, helps the burning.

MOORE, or MORE, (Edward), a late ingenious writer, was bred a linen-draper but quitted buſineſs to join the retinue of the muſes: and he certainly had a very happy and pleaſing talent for poetry, in his *Trial of Selim the Perſian*, he complimented lord Lyttleton in an elegant kind of panegyric, couched under the appearance of accuſation; and his *Fables for the female ſex*, for eaſy verſification, poignant ſatire, and ſtriking morals, approach nearer to the manner of Gay than any other of the numerous imitations of that author. He wrote alſo three dramatic pieces? The Gameſter, a tragedy; the Foundling, and Gil Blas, comedies. The ſucceſs of theſe was not ſuch as they merited; the firſt of them having met with a cold reception, Moore, Mooring.

ception, for no other apparent reaſon but becauſe it too nearly touched a favourite and faſhionable vice: and the ſecond having been condemned for its ſuppoſed reſemblance to Sir Richard Steele's *Conſcious Lovers*, but to which good judges have been inclined to give it greatly the preference. Mr Moore married a lady of the name of *Hamilton*, daughter to Mr Hamilton table-decker to the princeſſes; who had herſelf a very poetical turn, and has been ſaid to have aſſiſted him in the writing of his tragedy. One ſpecimen of her poetry, however, was handed about before their marriage, and has ſince appeared in print in different collections of ſongs, particularly in one called the *Goldfinch*. It was addreſſed to a daughter of the famous Stephen Duck; and begins with the following ſtanza:

> Would you think it, my Duck? (for the fault I muſt own),
> Your Jenny at laſt is quite covetous grown:
> Tho' millions if Fortune ſhould laviſhly pour,
> I ſtill ſhou'd be wretched if I had not More.

And after half a dozen ſtanzas more, in which, with great ingenuity and delicacy, and yet in a manner that expreſſes a ſincere affection, ſhe has quibbled on our author's name, ſhe concludes with the following lines:

> You may wonder, my girl, who this dear one can be,
> Whoſe merit can boaſt ſuch a conqueſt as me:
> But you ſhan't know his name, tho' I told you before,
> It begins with an M, but I dare not ſay More.

In the year 1753, Mr Moore commenced a weekly miſcellaneous paper intitled *The World, by Adam Fitz-Adam;* in which undertaking he was aſſiſted by Lord Cheſterfield with ſome eſſays. This paper was collected into volumes, and Mr Moore died ſoon after.

MOORING, the act of confining and ſecuring a ſhip in a particular ſtation, by chains or cables, which are either faſtened to the adjacent ſhore, or to anchors in the bottom.

A ſhip may be either moored by the head, or by the head and ſtern: that is to ſay, ſhe may be ſecured by anchors before her, without any behind; or ſhe may have anchors out, both before and behind her; or her cables may be attached to poſts, rings, or moorings, which anſwer the ſame purpoſe.

When a ſhip is moored by the head with her own anchors, they are diſpoſed according to the circumſtances of the place where ſhe lies, and the time ſhe is to continue therein. Thus wherever a tide ebbs and flows, it is uſual to carry one anchor out towards the flood, and another towards the ebb, particularly where there is little room to range about; and the anchors are laid in the ſame manner, if the veſſel is moored head and ſtern in the ſame place. The ſituation of the anchors, in a road or bay, is uſually oppoſed to the reigning winds, or thoſe which are moſt dangerous; ſo that the ſhip rides therein with the effort of both her cables. Thus if ſhe rides in a bay, or road, which is expoſed to a northerly wind and heavy ſea from the ſame quarter, the anchors paſſing from the oppoſite bows ought to lie eaſt and weſt from each other: hence both the cables will retain the ſhip in her ſtation with equal effort againſt the action of the wind and ſea.

Moorings, in ſea-language, are uſually an aſſemblage of anchors, chains, and bridles, laid athwart the bottom of a river or haven, to ride the ſhipping contained therein. The anchors employed on this occaſion have rarely more than one fluke, which is ſunk in the water near low-water mark. Two anchors being fixed in this manner in the oppoſite ſide of the river, are furniſhed with a chain extending acroſs from one to the other. In the middle of the chain is a large ſquare link, whoſe lower end terminates in a ſwivel, which turns round in the chain as about an axis, whenever the ſhip veers about with the change of the tide. To this ſwivel link are attached the bridles, which are ſhort pieces of cable, well ſerved, whoſe upper ends are drawn into the ſhip at the mooring-ports, and afterwards faſtened to the maſts or cable-bolts. A great number of moorings of this ſort are fixed in the harbours adjacent to the Engliſh dock-yards, as Deptford, Chatham, Portſmouth, Plymouth, &c.

Moorlands, Mop

MOORLANDS, a tract ſo called, in the north part of Staffordſhire, where the land riſes gradually into ſmall hills, which run through the midſt of England in one continued ridge, riſing higher and higher to Scotland, and ſending forth many rivers. The ſoil here is ſo foul and cold, that the ſnows lie almoſt all the year on the tops of the hills; and it is withal very rugged and barren: it, however, yields plenty of coal, lead, copper, rance-marble, and mill-ſtones; and ſome of the limeſtone hills bear ſuch a ſweet though ſhort graſs, as is very grateful to the oxen, of which there is a very good breed. It is obſerved here, that the weſt wind always brings rain, and the eaſt and ſouth fair weather; that though this tract is full of bogs, it is as healthy as any other part of the country; and that it produces the ſame plants as the Peak of Derby.

MOORS. See Morocco.

Moors, in the Iſle of Man, thoſe who ſummon the courts for the ſeveral ſheadings; ſuch as the lord's bailiffs. Every Moor has the like office with the Engliſh bailiff of the hundred.

MOOSE, or Elk. See Cervus.

MOOT, a difficult caſe, argued by the young barriſters and ſtudents at the inns of court, by way of exerciſe, the better to qualify them for practice, and to defend the cauſes of their clients. This, which is called *mooting*, is the chief exerciſe of the inns of court. Particular times are appointed for the arguing moot-caſes: the place where this exerciſe is performed was anciently called *moot-hall;* and there is a bailiff, or ſurveyor of the moots, annually choſen by the bench, to appoint the moot-men for the inns of chancery, and to keep an account of the performance of exerciſes. The word is formed either from the Saxon *mutan. gemetan*, "meeting;" or from the French *mot*, "word."

MOPSUS (fab. hiſt.), a celebrated prophet, ſon of Manto and Apollo during the Trojan war. He was conſulted by Amphimachus, king of Colophon, who wiſhed to know what ſucceſs would attend his arms in a war which he was going to undertake. He predicted the greateſt calamities; but Calchas, who had been a ſoothſayer of the Greeks during the Trojan war, promiſed the greateſt ſucceſſes. Amphimachus followed the opinion of Calchas; but the prediction of Mopſus was fully verified. This had ſuch an effect upon Calchas, that he died ſoon after. His death is attributed by ſome to another mortification of the ſame nature. The two ſoothſayers, jealous of each other's fame, came to a trial of their ſkill in divination. Calchas firſt aſked his antagoniſt, how many figs a neighbouring tree bore? 10,000 except one, replied Mopſus, and one ſingle veſſel can contain them all. The figs were gathered, and his conjectures were true. Mopſus now, to try his adverſary, aſked him how many young ones a certain pregnant ſow would bring forth? Calchas confeſſed his ignorance; and Mopſus immediately ſaid that the ſow would bring forth on the morrow ten young ones, of which only one ſhould be a male, all black, and that the females ſhould all be known by their white ſtreaks. The morrow proved the veracity of his prediction; and Calchas died by exceſs of the grief which his defeat produced. Mopſus after death was ranked among the gods, and had an oracle at Malia, celebrated for the true and deciſive anſwers which it gave—Another *Mopſus*, ſon of Ampyx and Chloris, born at Titareſſa in Theſſaly. He was the prophet and ſoothſayer of the Argonauts, and died at his return from Colchis by the bite of a ſerpent in Libya. Jaſon erected him a monument on the ſea-ſhore, where afterwards the Africans built him a temple where he gave oracles. He has often been confounded with the ſon of Manto, as their profeſſions and their names were alike.

MORÆA, in botany: A genus of the monogynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 6th order, *Enſatæ*. The corolla is hexapetalous; the three interior petals patent, the reſt like thoſe of the iris.

MORAI, is the name given at Otaheite in the South Sea to their burying-grounds, which are alſo places of worſhip. This is a pile of ſtone raiſed pyramidically upon an oblong baſe or ſquare 267 feet long and 87 wide. On each ſide is a flight of ſteps; thoſe at the ſides being broader than thoſe at the ends; ſo that it terminated not in a ſquare of the ſame figure with the baſe, but in a ridge like the roof of a houſe. There were 11 of theſe ſteps to one of theſe morais, each of which was 4 feet high, ſo that the height of the pile was 44 feet; each ſtep was formed of one courſe of white coral ſtone, which was neatly ſquared and poliſhed; the reſt of the maſs (for there was no hollow within) conſiſted of round pebbles, which from the regularity of their figure ſeemed to have been wrought. The foundation was of rock-ſtones, which were alſo ſquared. In the middle of the top ſtood an image of a bird carved in wood, and near it lay the broken one of a fiſh carved in ſtone. The whole of this pyramid made part of one ſide of a ſpacious area or ſquare 360 feet by 354, which was walled in with ſtone, and paved with flat ſtones in its whole extent. About 100 yards to the weſt of this building was another paved area or court, in which were ſeveral ſmall ſtages raiſed on wooden pillars about 7 feet high, which are called by the Indians *ewattas*, and ſeem to be a kind of altars, as upon theſe are placed proviſions of all kinds, as offerings to their gods. On ſome of them are ſeen whole hogs, and on others the ſkulls of above 50, beſides the ſkulls of many dogs. The principal object of ambition among the natives is to have a magnificent morai. The male deities (for they have them of both ſexes) are worſhipped by the men, and the female by the women; and each have morais, to which the other ſex is not admitted, though they have alſo morais common to both.

MORAL PHILOSOPHY, OR MORALS.

MORAL PHILOSOPHY is, "The ſcience of MANNERS OR DUTY; which it traces from man's nature and condition, and ſhows to terminate in his happineſs." In other words, it is "The knowledge of our DUTY and FELICITY;" or, "The art of being VIRTUOUS and HAPPY."

It is denominated an *art*, as it contains a ſyſtem of rules for becoming virtuous and happy. Whoever practiſes theſe rules, attains an habitual power or facility of becoming virtuous and happy. It is likewiſe called a *ſcience*, as it deduces thoſe rules from the principles and connections of our nature, and proves that the obſervance of them is productive of our happineſs.

It is an art, and a ſcience, of the higheſt dignity, importance, and uſe. Its object is man's duty, or his conduct in the ſeveral moral capacities and connections which he ſuſtains. Its office is to direct that conduct; to ſhow whence our obligations ariſe, and where they terminate. Its uſe, or end, is the attainment of happineſs; and the means it employs are rules for the right conduct of our moral powers.

Moral Philoſophy has this in common with Natural Philoſophy, that it appeals to nature or fact; depends on obſervation; and builds its reaſonings on plain uncontroverted experiments, or upon the fulleſt induction of particulars of which the ſubject will admit. We muſt obſerve, in both theſe ſciences, how nature is affected, and what her conduct is in ſuch and ſuch circumſtances: Or, in other words, we muſt collect the appearances of nature in any given inſtance; trace theſe to ſome general principles or laws of operation; and then apply theſe principles or laws to the explaining of other phenomena.

Therefore Moral Philoſophy inquires, not how man might have been, but how he is, conſtituted: not into what principles or diſpoſitions his actions may be artfully reſolved: but from what ptinciples and diſpoſitions they actually flow: not what he may, by education, habit, or foreign influence, come to be or do; but what, by his nature, or original conſtituent principles, he is formed to be and do. We diſcover the office, uſe, or deſtination of any work, whether natural or artificial, by obſerving its ſtructure, the parts of which it conſiſts, their connection or joint action. It is thus we underſtand the office and uſe of a watch, a plant, an eye, or hand. It is the ſame with a living creature of the rational or brute kind. Therefore, to determine the office, duty, or deſtination of man; or, in other words, what his buſineſs is, or what conduct he is obliged to purſue; we muſt inſpect his conſtitution, take every part to pieces, examine their mutual relations one to the other, and the common effort or tendency of the whole.

It has not been thus, however, that the ſcience has always been taught. The earlieſt moraliſts did not erect ſyſtems upon a juſt analyſis of the powers of the human mind; nor have all thoſe who thought ſuch a foundation neceſſary to be laid, deduced their theories from the very ſame principles. As moral truths are not capable of rigid demonſtration, it appears to us, that we cannot more properly introduce the ſyſtem which we have adopted, than by giving our readers a ſhort view of the moſt celebrated ſyſtems that have been maintained by others. They will thus have an opportunity of judging for themſelves of the reſpective merits of the different theories, and of adopting that which ſhall appear to them to place practical virtue on the firmeſt baſis.

History of the Science of Morals.

1 Various opinions concerning the criterion of virtue, &c.

Whilst there has been a remarkable agreement among the writers on morality, as to the particular actions which are virtuous and thoſe which are vicious; and whilſt they have uniformly taught, that it is our duty and our intereſt to perform the one and to avoid the other; they have yet differed exceedingly concerning the *teſt* or *criterion* of virtue, as well as concerning the *principle* or *motive* by which men are induced to purſue it. One cauſe of this difference in opinion reſpecting matters of ſuch univerſal importance, may perhaps be traced to the miſtakes into which philoſophers are apt to fall concerning the original ſtate of man.

2 Probable cauſe of this variety.

It is very generally taken for granted, that the firſt men were ſavages of the loweſt rank, and that the race gradually civilized itſelf during the courſe of many ſucceeding ages. Without mutual intercourſe, the progreſs of civilization could never have commenced; and as the practice of juſtice is abſolutely neceſſary to every ſpecies of friendly intercourſe, thoſe original ſavages, it is ſuppoſed, muſt have been juſt in their dealings, and juſt upon ſome principle which has its foundation in human nature. But to develope the principle by which ſavages are influenced in their conduct, no tedious or intricate proceſs of reaſoning can be neceſſary. It muſt have a place in every mind, and be inſtantaneous in all its deciſions. Hence it has been ſuppoſed, that the principle to which modern philoſophers have given the name of the *moral ſenſe*, is inſtinctive; that it is the ſole judge of virtue and vice; and that its admonitions have ſuch authority, as to enforce obedience without regard to the conſequences of any action.

Other philoſophers, who deny that the moral ſenſe is inſtinctive, and who yet ſuppoſe that the original ſtate of man was ſavage, are forced to pile hypotheſis upon hypotheſis, each unnatural in itſelf, and all contradictory to one another, in order to account for the commencement of civilization and the formation of ſociety. It has been ſuppoſed, that the deſire of ſelf preſervation and the love of power are the governing principles in human nature; that in the ſavage ſtate every man had a right to every thing which he could ſeize by fraud or force; that all had an innate propenſity to invade each other's property; and that hence war, rapine, and bloodſhed, prevailed univerſally, till the ſavages diſcovered the expediency of uniting under ſome form of government for their mutual protection.

But before the original ſtate of man had been made the baſis of ſuch oppoſite theories as theſe, it would ſurely have been proper to inquire upon what grounds that ſtate has been ſuppoſed to be ſavage. To us theſe grounds appear to be nothing better than mere imaginations; the dreams of poets, and of ſuch philoſophers as bend facts to their own ſyſtems. In the authentic *hiſtory* of our ſpecies, there is no evidence, indeed there can be no evidence, that the firſt men were ſavages; and every thing which we know of human nature leads us to believe, that had they been ſo, the race could never have been civilized but by the miraculous interpoſition of ſome ſuperior being. The only record of the earlieſt ages of the world to which the ſmalleſt credit is due, repreſents all the nations of the earth as having ſprung from one pair, and that pair as having been inſtructed in their duty by their beneficent Creator. If this be the fact, and no conſiſtent theiſt can controvert it, the precepts of morality would be originally conveyed from one generation to another; not in a ſyſtematical or ſcientific form, but as the laws of the Univerſal Sovereign, whoſe authority demanded implicit obedience. Accordingly we find, that the firſt teachers of morals were men of ſuperior rank as well as of eminent talents, who formed collections of maxims derived from their anceſtors, "with the view of perfecting ſubordination ‡, poliſhing manners, and educating youth. Such were the proverbs of Solomon, the words of Agur, and the wiſdom of the ſon of Sirach." Theſe inſtructors did not analyſe the human mind into its various faculties, and build a ſyſtem of morals either upon a particular inſtinct pointing to the ſupreme good, or upon the fitneſs of things diſcovered by reaſon. Short iſolated ſentences were the mode in which they conveyed their precepts; which they prefaced by obſerving, that "the fear of the Lord is the beginning of knowledge;" and enforced by the aſſurance, that "length of days, and long life, and peace, ſhould they add to thoſe who obeyed them." The ſayings of the celebrated wiſe men of Greece were collections of apophthegms, made in the ſame manner and delivered with ſimilar views. Thales and Pythagoras †, who founded the one the Ionic and the other the Italic ſchool, made collections of precepts for the conduct as well of a ſtate as of a private life. "Neither the crimes nor the thoughts of bad men (ſaid Thales) are concealed from the gods. The only method of being juſt, is to avoid doing that which we blame in others." Of Pythagoras it is related by Porphyry and Laertius, that from Samos he repaired to Delos, and after preſenting an offering of cakes to Apollo, there received, or pretended to receive, moral dogmas from the prieſteſs; which he afterwards delivered to his diſciples under the character of divine precepts. Amongſt theſe were the following: That, "next to gods and demons, the higheſt reverence is due to parents and legiſlators; and that the laws and cuſtoms of our country are to be religiouſly obſerved."

3 Modes of communicating inſtruction by the earlieſt moraliſts.

To theſe maxims or apophthegms, which, for the ſake of delighting the ear and aiding the memory,

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‡ Bruce's Elements of the Science of Ethics.

† Bruce's Elements, and Enfield's Hiſtory of Philoſophy.

were ſometimes delivered in verſe, ſucceeded, as has been ſuppoſed, the mode of inſtruction by fable or allegory. But the truth ſeems to be, that this method, of communicating moral and political wiſdom was as ancient as the other: for we have a beautiful ſpecimen of it in the ninth chapter of the book which relates the tranſactions of the judges of Iſrael. The fables of Eſop, too, which were written at a very early period, remain laſting models of this ſpecies of art among the Greeks.

When the inſtructors of mankind had proceeded thus far as to give an artificial form to their precepts, they ſoon advanced a ſtep farther, and reduced their obſervations into claſſes or predicaments. Pythagoras, who viſited Egypt, has been ſuppoſed to have learned from its prieſts the method of arranging the virtues into diſtinct claſſes. But it is the opinion of an excellent writer †, founded on the previous aſpects of ethics, and on the comprehenſive talents of the Samian philoſopher, that the honour of the invention ought to be aſcribed to himſelf. Be this as it may, it was obſerved by the inventor, that " all the maxims of morality might be referred to the duties which men owe to themſelves, and the duties which they owe to each other." Hence the four cardinal virtues of the ancients, PRUDENCE, TEMPERANCE, FORTITUDE, and JUSTICE; of which the firſt three refer to the individual, and the fourth to ſociety.

† Mr Bruce.

4
The moral principles of Socrates.

Hitherto leſſons in morality had not taken a ſyſtematic form; but they were gradually approaching to it. Socrates was perhaps the firſt Pagan philoſopher who eſtabliſhed all his precepts on one ſure and ſteady baſis. In his lectures and diſcourſes, he ſeems to have had one great object in view §, to connect the moral maxims which were fitted to regulate the conduct of mankind, with ſublime conceptions reſpecting the character and government of a ſupreme Being. The firſt principles of virtuous conduct which are common to all mankind, are, according to this excellent moraliſt, laws of God: and the concluſive argument by which he ſupports this opinion is, that no man departs from theſe principles with impunity. " It is frequently poſſible (ſays he) for men to ſcreen themſelves from the penalty of human laws, but no man can be unjuſt or ungrateful without ſuffering for his crime; hence I conclude, that theſe laws muſt have proceeded from a more excellent legiſlator than man." From this it would appear, that in the opinion of Socrates, conſcience, or the moral ſenſe, approving of any action, is the criterion by which it is known to be virtuous, and the will of God, that which obliges men to perform it.

§ Bruce's Elements, and Enfield's Hiſtory, &c.

5
Origin of the Greek ſects.

Socrates himſelf left no writings behind him, nor, as far as we know, offered any regular and complete theory of ethics. His diſciples, however, who were numerous and diſtinguiſhed, became the founders of the celebrated Greek ſects. Among them the firſt great queſtion was, " what are the foundations of virtue?" and the ſecond, " what are the diſtinctions betwixt good and evil, happineſs and miſery?" The anſwers given to theſe important queſtions divided the philoſophers and their diſciples into diſtinct orders.

6
Theories of Plato.

In anſwer to the former queſtion, Plato taught *, that " virtue is to be purſued for its own ſake; and that being a divine attainment, it cannot be taught, but is the gift of God." This ſeems to differ in nothing but the name from the doctrine of thoſe moderns who place the ſole foundation of virtue in the approbation of the moral ſenſe. The founder of the academy indeed has no ſuch phraſe as *moral ſenſe* in any of his writings with which we are acquainted; but if virtue cannot be taught, and if it is to be purſued for its own ſake, it muſt in itſelf be *good*, and the object of ſome feeling, whether called *ſenſe*, *inſtinct*, or *paſſion*. His ſolution of the ſecond queſtion agitated among the ſects is not indeed very conſiſtent with this neceſſary inference from his anſwer to the firſt; but for his inconſiſtencies we are not accountable. " Our higheſt good (he ſays) conſiſts in the contemplation and knowledge of the firſt good, which is mind or God; and all theſe things which are called *good* by men, are in reality ſuch only ſo far as they are derived from the firſt and higheſt good. The only power in human nature which can acquire a reſemblance to the ſupreme good, is reaſon; and this reſemblance conſiſts in prudence, juſtice, ſanctity, and temperance."

* Enfield.

7
Of Ariſtotle.

Ariſtotle, the founder of the Peripatetic ſchool, was the pupil of Plato; but of the two great moral queſtions he gives ſolutions ſomewhat different from thoſe of his maſter. " Virtue (according to him ‡) is either theoretical or practical. Theoretical virtue conſiſts in the due exerciſe of the underſtanding: practical, in the purſuit of what is *right* and *good*. Practical virtue is acquired by habit and exerciſe." This theory ſeems to differ little from that adopted by Cudworth, Clarke, and Price, which ſhall be conſidered afterwards. With reſpect to happineſs or good, the doctrine of Ariſtotle is very rational. " Pleaſures (he ſays) are eſſentially different in kind. Diſgraceful pleaſures are wholly unworthy of the name. The pureſt and nobleſt pleaſure is that which a good man derives from virtuous actions. Happineſs, which conſiſts in a conduct conformable to virtue, is either contemplative or active. Contemplative happineſs, which conſiſts in the purſuit of knowledge and wiſdom, is ſuperior to active happineſs, becauſe the underſtanding is the higher part of human nature, and the objects on which it is employed are of the nobleſt kind. The happineſs which ariſes from external poſſeſſions is inferior to that which ariſes from virtuous actions; but both are neceſſary to produce perfect felicity."

‡ Enfield.

8
Of the Stoics.

The Stoics, another celebrated ſect of Greek philoſophers, maintained †, that " nature impels every man to purſue whatever appears to him to be good." According to them, " ſelf-preſervation and defence is the firſt law of animated nature. All animals neceſſarily derive pleaſure from thoſe things which are ſuited to them; but the firſt object of purſuit is, not pleaſure, but conformity to nature. Every one, therefore, who has a right diſcernment of what is good, will be chiefly concerned to conform to nature in all his actions and purſuits. This is the origin of moral obligation." With reſpect to happineſs or good, the ſtoical doctrine was altogether extravagant: They taught, that " all external things are indifferent, and cannot affect the happineſs of man; that pain, which does not belong to the mind, is no evil; and that a wiſe

† Enfield.

wiſe man will be happy in the midſt of torture, becauſe virtue itſelf is happineſs (B).

As the ſtoics held that there is but one ſubſtance, partly active and partly paſſive, in the univerſe (ſee METAPHYSICS, n° 261, 262.), and as they called the active principle *God*, their doctrine, which makes virtue conſiſt in a conformity to *nature*, bears no ſmall reſemblance to that of thoſe moderns who reſt moral obligation on the *Divine will*. It was therefore on better grounds than has been ſometimes ſuppoſed, that Warburton, when characterizing the founders of the three principal ſects in Greece, repreſented * *Plato* as the patron of the *moral ſenſe*; *Ariſtotle*, of the *eſſential differences*; and *Zeno*, of *arbitrary will*. Theſe principles, when ſeparated from each other, and treated in the manner of the ancients, may not each be able to bear the ſuperſtructure which was raiſed upon it; but the principles of moſt of the other ſects were much leſs pure, and infinitely more dangerous.

* Div. Leg. of Moſes.

9
Of Ariſtippus, Democritus, and Protagoras

Cudworth †, whoſe teſtimony when relating the doctrines of antiquity is entitled to the fulleſt credit, affirms, that Ariſtippus the founder of the Cyrenaic ſchool, Democritus, and Protagoras, with their followers among the atomiſts, taught, that "the diſtinction between virtue and vice is merely arbitrary; that nothing is juſt or unjuſt, ſacred or profane, but as it is agreeable or contrary to eſtabliſhed laws and cuſtoms; that what is juſt to-day, human authority may make unjuſt to-morrow; and that preſent pleaſure is the ſovereign good of man."

† Eternal and immutable Morality.

10
And of Epicurus.

With theſe impieties, the moral doctrines of Epicurus have very unjuſtly been confounded. The phyſical and metaphyſical ſyſtems of that philoſopher are indeed ſtrange compoſitions of ingenuity and abſurdity, truth and falſehood; and the moral precepts of many of his followers were in the higheſt degree licentious and impure. But his own life was exemplary; and his ethical ſyſtem, if candidly interpreted, is much more rational than that of the Stoics; though it muſt be confeſſed, that no ſect produced men of more determined virtue than the ſchool of Zeno.— According to Epicurus ‡, "the end of living, or the ultimate good which is to be ſought for its own ſake, is happineſs. The happineſs which belongs to man, is that ſtate in which he enjoys as many of the good things, and ſuffers as few of the evils incident to human nature as poſſible; paſſing his days in a ſmooth courſe of tranquillity. Pleaſure is, in its own nature good, as pain is in its nature evil. The one is therefore to be purſued, and the other to be avoided, for its own ſake. Pleaſure and pain are not only good and evil in themſelves, but they are the meaſure of what is good or evil in every object of deſire and averſion; for the ultimate reaſon why we purſue one thing and avoid another is, becauſe we expect pleaſure from the former, and apprehend pain from the latter. That pleaſure, however, which prevents the enjoyment of a greater pleaſure, or produces a greater pain, is to be ſhunned; and that pain, which either removes a greater pain, or procures a greater pleaſure, is to be endured."

‡ Enfield's Hiſtory.

Upon theſe ſelf-evident maxims, Epicurus build his ſyſtem of ethics; and proves with great force of argument, "that a ſteady courſe of virtue produces the greateſt quantity of happineſs of which human nature is capable." Without a *prudent* care of the body, and a ſteady government of the mind to guard the one from diſeaſes and the other from the clouds of prejudice,' happineſs is unattainable. By *temperance* we enjoy pleaſure, without ſuffering any conſequent inconvenience. *Sobriety* enables us to content ourſelves with ſimple and frugal fare. *Gentleneſs*, as oppoſed to an iraſcible temper, greatly contributes to the tranquillity and happineſs of life, by preſerving the mind from perturbation, and arming it againſt the aſſaults of calumny and malice. *Fortitude* enables us to bear thoſe pains which prudence cannot ſhun, and baniſhes fear from the mind; and the practice of *juſtice* is abſolutely neceſſary to the exiſtence of ſociety, and by conſequence to the happineſs of every individual." Theſe reaſonings come home to every man's boſom; and had not this philoſopher, by denying the providence, if not the being, of God, moſt unhappily excluded from his ſyſtem the very poſſibility of a future ſtate of retribution, his moral philoſophy would have been the moſt rational, and of courſe the moſt uſeful, of any that was taught in the ſchools of Greece. This enormous defect, however, laid it open to the groſſeſt corruptions; and by his followers it was in fact corrupted ſo as to countenance the moſt impure and criminal pleaſures of ſenſe.

11
The eclectic philoſophers of Alexandria.

Theſe ſeveral ſyſtems of ethics continued to be cultivated with more or leſs purity through all the revolutions of the Grecian ſtates, and they were adopted by the Romans after Greece itſelf became a province of the empire. They had been introduced into Egypt during the reigns of the Ptolemies, and were taught with much celebrity in the ſchools of Alexandria.— The philoſophy which was moſt cultivated in thoſe ſchools was that of Plato; but from a deſire of uniformity which took poſſeſſion of the Alexandrian Platoniſts, many of the dogmas of Ariſtotle and Zeno, as well as the extravagant fictions of the eaſt, were incorporated with the principles of the old academy.— The patrons of this heterogeneous maſs have been called *eclectic* philoſophers, becauſe they profeſſed to ſelect from each ſyſtem thoſe doctrines which were rational and important, and to reject every thing which was falſe or futile; but they added nothing to the purity of Plato's ethics, and they increaſed the obſcurity and myſticiſm of his phyſics and metaphyſics.

12
Extinction and revival of moral ſcience in Europe.

After the ſubverſion of the Roman empire, every ſpecies of philoſophy, if ſyllogiſtic wrangling deſerve not that name, was baniſhed for ages from the ſchools of Europe; and ethics, properly ſo called, gave place to eccleſiaſtical caſuiſtry, and to the ſtudy of the civil and canon law. When the Greeks, whom the fury and fanaticiſm of Mahomet II. had driven from Conſtantinople, introduced into Italy the knowledge of their own language, the entire ſtores of ancient philoſophy were again unlocked; the ſyſtems of the different ſects were adopted with the utmoſt avidity; and, without

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(B) Since this ſhort hiſtory was written, a very pleaſing view of Stoiciſm has been given to the public in Ferguſon's *Principles of moral and political Science*; a work which the ſtudent of ethics will do well to conſult. Perhaps the amiable author may unintentionally have ſoftened the auſtere dogmas of the Porch, by transfuſing into them ſomething of the mild ſpirit of the goſpel; but if ſo, he has much improved the ſyſtem of Zeno.

accurate inveſtigation of their reſpective merits, men became Platoniſts, Peripatetics, or Stoics, as fancy or caprice prompted them to chooſe their leaders. The *αυτος εφα* of Ariſtotle in particular, had not leſs authority over his modern admirers than it had of old in the Lyceum at Athens. At length the ſpirit of Luther and the genius of Bacon broke theſe fetters, and taught men to think for themſelves as well in ſcience as in religion. In phyſics, the effects produced by the writings of Bacon were great and rapid; for in phyſics the ancient theories were totally and radically wrong.—With reſpect to morals, however, the caſe was different. Each of the celebrated ſchools of antiquity was in poſſeſſion of much moral truth, blended indeed with error; and long after the Stagyrite and his rivals had loſt all influence in phyſical ſcience, philoſophers of eminence followed them implicitly in the ſcience of ethics.

13 Theories of Hobbes.

At this day, indeed, there is hardly a theory of morals at all diſtinguiſhed, to which ſomething very ſimilar may not be found in the writings of the ancients.—Hobbes adopted the principles of Democritus and Protagoras, and taught expreſsly that "there is no criterion of juſtice or injuſtice, good or evil, beſides the laws of each ſtate; and that it is abſurd to inquire at any perſon except the eſtabliſhed interpreters of the law, whether an action be right or wrong, good or evil (A)." Theſe impious abſurdities have been often confuted. Cudworth, who compoſed his *True Intellectual Syſtem of the Univerſe* in order to trace the metaphyſical atheiſm of Hobbes to its ſource, and to expoſe it to the public in all its weakneſs, undertook likewiſe to overthrow his ethical ſyſtem, in a treatiſe, intitled *Of Eternal and Immutable Morality*. That work was left unfiniſhed; but the theory of its great author was adopted, illuſtrated, and very ably ſupported, by the Doctors Clarke and Price.

14 Of Cudworth, Clarke, and Price.

According to theſe three admirable ſcholars, "we feel ourſelves irreſiſtibly determined to approve ſome actions, and to diſapprove others. Some actions we cannot but conceive of as *right*, and others as *wrong*; and of all actions we are led to form ſome idea, as either *fit* to be performed, or *unfit*, or as neither fit nor unfit to be performed, i. e. as *indifferent*. The power within us which thus perceives and determines, they declare to be the *underſtanding*; and they add, that it perceives or determines immediately or by intuition, becauſe *right* and *wrong* denote *ſimple ideas*. As there are ſome propoſitions, which when attended to neceſſarily determine all minds to *believe* them, ſo are there ſome actions whoſe natures are ſuch, that when obſerved all rational beings immediately and neceſſarily *approve* them. He that can impartially attend, it is ſaid, to the nature of his own perceptions, and determine that when he conceives gratitude or beneficence to be *right*, he perceives nothing *true* of them, or *underſtands* nothing, but only *ſuffers* from a ſenſe, has a turn of mind which appears unaccountable: for the more we examine, the more indiſputable it will appear to us, that we expreſs *neceſſary* truth, when we ſay of ſome actions that they are right, and of others that they are wrong." It is added, that "we cannot perceive an action to be right without *approving* it, or *approve* it without being conſcious of ſome degree of *ſatisfaction* and complacency; that we cannot perceive an action to be wrong without *diſapproving* it, or *diſapprove* it without being diſpleaſed with it; and that the *firſt* muſt be liked, the *laſt* diſliked; the *firſt* loved, the *laſt* hated." By the patrons of this ſyſtem, *obligation* to action, and *rightneſs* of action, are held to be coincident or identical. "Virtue, they affirm, has a real, full, obligatory power, antecedently to all laws, and independently of all will; for obligation is involved in the very nature of it. To affirm that the performance of that which to omit would be wrong is not obligatory, unleſs conducive to private good, or enjoined by a ſuperior power, is a manifeſt contradiction *."

* Price's Review, and Clarke's Attributes.

Few men have deſerved better of letters and philoſophy than Cudworth, Clarke, and Price; and yet their theory of morals appears to us to be contradictory and unintelligible. It is certainly romantic, and founded upon principles which, if they be denied, no man by argument can be compelled to grant. There is, ſay they, an abſolute right and wrong, fitneſs and unfitneſs, in actions; but if ſo, the actions which are *right* and *fit* muſt be right and fit for ſomething, becauſe fitneſs, which reſpects no end, is wholly inconceivable. To ſay that any particular action is *fit*, and yet fit for *no particular purpoſe*, is juſt as abſurd as to ſay that the angles at the baſe of an iſoſceles triangle are equal, but neither to *one another*, nor to *any other angles*; and we may with no leſs propriety talk of the relation of equality attaching to a particular angle, and to nothing elſe with which the angle is equal, than of the *abſolute* fitneſs or rightneſs of any action or courſe of actions. If it be ſaid that ſuch actions are fit and right, becauſe they tend to promote the harmony of the world and the happineſs of men, this may be granted; but it overturns the intellectual theory from its very foundation. Actions which are fit and right only for their conſequences, are approved and liked for the ſake of thoſe conſequences; and the happineſs of men, among whom the virtuous perſon himſelf is to be included, is the motive or ultimate obligation to their performance.

Similar to this theory, and liable to the ſame objections is that which reſolves moral approbation into a ſenſe of propriety; for if actions be approved becauſe they are proper, it muſt be becauſe they are proper for ſome *end or purpoſe*, propriety in the abſtract being a word without meaning.

15 Of Lord Shafteſbury and Hutcheſon, &c.

Many philoſophers, feeling the force of theſe and of ſimilar objections to the intellectual theory of Cudworth, Clarke, and Price, as well as to a ſenſe of *propriety* in the abſtract, have had recourſe to another hypotheſis apparently better founded. Obſerving that all mankind decide on the morality of characters and actions inſtantaneouſly, without weighing their conſequences in the balance of reaſon, they ſuppoſe that ſuch deciſions are made by an *inſtinct* of our common nature, implanted in the human breaſt by the hand that formed it. To this inſtinct ſome of them give the

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(A) Doctrinas de juſto et injuſto, bono et malo, præter leges in unaquaque civitate conſtitutas, authenticas eſſe nullas: et utrum aliqua actio juſta vel injuſta, bona vel mala futura ſit, a nemine inquirendum eſſe, præterquam ab illis, quibus legum ſuarum interpretationem civitas demandaverit. *De cive*, p. 343.

the name of *conſcience*, and others that of *moral ſenſe*, in contradiction to *external ſenſe*, the other great and univerſal inlet of human knowledge. By this *moral ſenſe* we intuitively diſcover an eſſential difference in the *quality* of all thoughts and actions, and a general diſtinction of them into *good* and *evil*, juſt as by the *tongue* and *palate* we diſcover an eſſential difference in the *taſte* of all objects, and a general diſtinction of them into *pleaſant* and *unpleaſant*. The ableſt advocates for this inſtinctive ſyſtem agree, that the moral ſenſe is the immediate and involuntary criterion of only a few general truths, which, in their joint operation upon the mind, lay the baſis of moral obligation. Others have carried it to what we think a very dangerous extreme; as, by affirming that we cannot prove, in regard to our moral feelings, that they are conformable to any extrinſic and external relations of things, they ſeem to wiſh that reaſon were baniſhed from the ſcience of ethics. Were this true, it would in many caſes be impoſſible to diſtinguiſh the prejudices of early education from the pure dictates of original inſtinct, and the moſt pernicious conduct might be ſanctified with the approbation of what would be deemed the ultimate teſt of virtue and vice.

To remedy the defects of the intellectual and inſtinctive theories of morality, Mr Hume blended them together; and, upon the broader baſis of reaſon and internal ſenſe co-operating with each other, he reared a ſyſtem which, though different from thoſe of all his predeceſſors, he rendered plauſible, and ſupported with his uſual ingenuity.

16
Of Mr
Hume.

According to him, *ſentiment* and *reaſon* concur in almoſt all moral determinations; and he proves, that for this purpoſe "there is implanted in the human breaſt a diſintereſted principle of *benevolence* or *ſympathy* which makes men take pleaſure in each other's happineſs. The merit or demerit of actions conſiſts wholly in their utility or natural tendency to add to the ſum of human happineſs: and the ſame he holds to be true of qualities whether bodily or mental. This utility or natural tendency it is the office of reaſon to diſcover; for that faculty alone can trace relations and conſequences. Such qualities or actions as reaſon diſcovers to be uſeful, either to the individual or to ſociety, the inſtinctive principle of benevolence makes us inſtantly approve, and this approbation conſtitutes their morality. Thus, temperance, fortitude, courage, and induſtry, &c. reaſon diſcovers to be uſeful to him who poſſeſſes them; and upon this diſcovery they are approved of by the ſentiment of ſympathy. They are therefore moral qualities, and the ſources of the *private* virtues. In like manner, generoſity, cheerfulneſs of temper, mercy and juſtice, are diſcovered to be uſeful to ſociety; and are accompanied with the approbation of that ſentiment of ſympathy which makes every man feel a ſatisfaction in the felicity of all other men. They therefore conſtitute the *ſocial* virtues. Of every quality and every action, the merit or demerit, and of conſequence the degree of approbation or diſapprobation which is beſtowed upon it, is in exact proportion to its utility and the circumſtances of the caſe in which it occurs. The ſocial virtues are therefore greater than thoſe which are private, and one ſocial virtue is greater than another; but every quality and every action which is uſeful, either to ſociety or to the individual, is more or leſs virtuous, provided the good of the individual be conſidered as ſubordinate to the good of the public."

This theory is ingenious: and in placing the merit of actions in their utility, it furniſhes a criterion of virtue which can be employed by reaſon; but it ſeems not to be wholly free from error, and it is obviouſly defective. By pretending that the ſame ſentiment of approbation is given to uſeful actions voluntarily performed, and to uſeful qualities which are merely conſtitutional, Mr Hume confounds the merit of virtuous habits with the value of natural talents. Yet every man's conſciouſneſs will ſurely tell him, that the feeling or ſentiment which attaches to deeds of juſtice, clemency, and beneficence, is very different from that which attaches to beauty of form, ſtrength of body, vigour of mind, and mere extent of capacity. All theſe actions and qualities are uſeful; but when we approve of the former, beſides attending to their utility we conſider them as in the man's power, and attribute the merit of them immediately to himſelf. When we approve, or rather admire, the latter on account of their utility, we know them to be not in the man's power, and we attribute the merit of them immediately to the Author of nature,

But the defects of this theory are in practice more pernicious than its errors. The author well obſerves that the end of all moral ſpeculations is to teach us our duty; and, by proper repreſentations of the deformity of vice and beauty of virtue, to beget correſpondent habits, and engage us to avoid the one and embrace the other: but the theory under review holds out no motive ſufficient in all caſes for this purpoſe.

It is indeed true, as Mr Hume affirms, that the virtues which are immediately uſeful or agreeable to the perſon poſſeſſed of them, are deſirable in a view to ſelf-intereſt, and that a regard to ſelf-intereſt ought to engage us in their purſuit. It is likewiſe true, that the virtues which are *uſeful* and *agreeable* to others, are generally more deſirable than the contrary qualities: for as by the conſtitution of our nature no enjoyment is ſincere without ſome reference to company and ſociety; ſo no ſociety can be agreeable, or even tolerable where a man feels his preſence unwelcome, and diſcovers all around him ſymptoms of diſguſt and averſion. Theſe conſiderations he deems ſufficient to enforce the duties of humanity, clemency and beneficence; but he ſtates a caſe himſelf, in which they would certainly fail to make a man abſtain from his neighbour's property. The greater part of property he conſiders, and rightly conſiders, as having its foundation in human laws, which are ſo calculated as to preſerve the peace and promote the general good of the ſociety, at the unavoidable expence ſometimes of the individual. Now, in particular incidents, a ſenſible knave, by ſecretly purloining from the hoards of a worthleſs miſer, might make himſelf comfortable and independent for life, without cauſing any breach in the ſocial union, and even without hurting a ſingle individual. What then ſhould hinder him from acting thus? His ſelf-intereſt would be promoted; and if he poſſeſſed a generous ſpirit, he might gratify his ſentiment of benevolence or ſympathy by doing good with his money to the poor, which the miſer never did. For enforcing the uniform practice of juſtice in ſuch caſes as this, Mr Hume's theory of morals contains no adequate motive; but a very ſufficient one is held out by the ſyſtem which we are now to conſider.

17 A ſyſtem of ethics built upon religion.

That ſyſtem, which ſeems to have been unknown to the ancients, is built upon religion, of which indeed it conſtitutes a very eſſential part; and thoſe by whom it has been taught, maintain that no other foundation is ſufficient to bear a regular ſuperſtructure of practical ethics. The philoſophers of this ſchool (D) define virtue to be "the doing good to mankind, in obedience to the will of God, and for the ſake of everlaſting happineſs:" So that with them "the good of mankind" is the *ſubject*, "the will of God" the *criterion* or *rule*, and "everlaſting happineſs" the *motive*, of human virtue. The moral ſenſe, ſuppoſing it real, they conſider as a very inadequate rule of conduct, as being in many caſes difficult to be diſtinguiſhed from prejudice; and many of them confidently deny its exiſtence. The other rules, ſuch as the *fitneſs of things*, abſtract *right*, the *truth of things*, the *law of reaſon*, &c. they conſider either as unintelligible, or as relative to ſome end by which the rules muſt themſelves be tried. The two great queſtions, which in the ſyſtem of theſe religious philoſophers demand ſolution, are; *1ſt*, By what means ſhall a man in every caſe diſcover preciſely what is the will of God? and, *2dly*, what evidence have we that there will be a future ſtate of retribution and of everlaſting happineſs!

Of theſe two queſtions, the latter belongs wholly to religion: and to ſolve it they call in the aid of revelation, as well as that of which is called the religion of nature. The former queſtion is in the province of morality: and to find anſwers to it which will apply to every caſe, is the whole buſineſs of their ſyſtem:

The will of God reſpecting human conduct may be diſcovered by reaſoning *à priori* from his exiſtence and attributes, or *à poſteriori* from the tendency of his works. Being himſelf independent and all-perfect, it is inconceivable that his view in creating the world could be any thing elſe than to communicate ſome portion of his own felicity. (See METAPHYSICS, n° 312.) This concluſion is agreeable to what we perceive of his works, in which there are a thouſand contrivances, all tending to give happineſs to man, and to all animated nature; and not one of which the natural tendency is to inflict pain, or prove ultimately injurious. Mankind are linked together by various ties, and made to depend in a great meaſure upon each other's conduct. That conduct, therefore, which is naturally productive of the greateſt ſum of human happineſs, muſt be agreeable to the will of God; or, in other words, virtuous conduct. That, of which the natural tendency is the reverſe, muſt be vicious; and that conduct, if there be any ſuch, which tends to produce neither happineſs nor miſery, muſt be indifferent, i. e. neither morally good nor morally evil. It is to be obſerved, however, that as, previous to their own obedience or diſobedience, all men ſtand in the ſame relation to their Creator, it muſt be his will that an equal portion of the happineſs of which human nature is capable be communicated to all by whom that nature is ſhared. Whence it follows, that only ſuch conduct as, if univerſally purſued by all men in the ſame ſtation and circumſtances, would be productive of the greateſt ſum of human happineſs on the whole, can be agreeable to the will of the Creator; and that in judging of the morality of actions, we are not to regard their immediate conſequences in any particular caſe, but their natural and ultimate tendency if performed in all caſes.

This is a criterion of virtue which differs widely from the local or occaſional utility ſet up by Mr Hume; for the particular conſequences of an action and its general tendency may often be at variance, ſo that what might in certain circumſtances be immediately uſeful, would yet be highly criminal and ultimately pernicious. The general tendency of actions, too, may be always known, and known with the utmoſt certainty; the whole of their particular conſequences can never be diſcovered. One thing, however, is evident, that if all men in their reſpective ſtations would regulate their conduct by the natural tendency of every action, the *particular* and *general* conſequences of their conduct would be the ſame, and the greateſt happineſs would reſult from it of which human nature is in this world capable. And therefore, ſince it is only through the perverſeneſs of ſome perſon or perſons concerned, that the *particular conſequences* of any action, of which the *natural tendency* is to produce *miſery*, can ever bring *happineſs* to a ſingle individual; it can no more be the will of God that we make theſe *occaſional* and *diſtorted* conſequences the rule of our conduct, than it can be his will that the *vices* of other men ſhould be the baſis of our *virtues*. According to this ſcheme of morals, which reſts all obligation on private happineſs, the whole difference between an act of *prudence* and an act of *duty*, is this; That in the former caſe we conſider only what we ſhall gain or loſe in this world; in the latter, what we ſhall gain or loſe in the world to come.

Although the patrons of this theory queſtion the reality of the moral ſenſe as an inſtinct, they allow that a ſentiment of approbation or diſapprobation of actions, according as they are virtuous or vicious, is generated by the aſſociating principle (ſee INSTINCT, and METAPHYSICS, n° 97.); and that this ſentiment, though factitious, operates inſtantaneouſly as if it were inſtinctive. They inſiſt that our earlieſt actions are the reſult of imitation; that when we firſt begin to trace conſequences, education and the deſire of immediate enjoyment are our only guides; that as our mind expands and our knowledge increaſes, the hopes and fears of futurity become the *motives*, and the will of God the *rule* of our conduct: and that long practice in virtue, upon theſe principles, produces habits by which we go on with ſatisfaction in the ſame courſe, without looking forward, on every *particular* occaſion, to the ultimate conſequences and firſt motives of our actions. Thus do habits of juſtice, benevolence, clemency, and moral approbation, ſpring, through a proper courſe of diſcipline, out of the ſelfiſh principle; and when theſe habits are completely formed and deeply rooted, man has attained the utmoſt perfection of which he is capable in this ſtate of probation, and is fitted for another of retribution and happineſs.

19 Defects and excellency of the ſyſtem.

That theſe philoſophers have not a juſt view of human nature, when they deny that there is any innate principal of benevolence in man, we ſhall endeavour to

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(D) Gastrell, Cumberland, Puffendorf, Norris, Berkeley, Gay, Low, Rutherforth, Soame, Jenyns, Dr Johnson, Mr Paley, and Mr Gisborne, &c.

to ſhow when we lay the foundation of that theory which we think deſerves to be preferred to all others; but we fully agree with a candid and able writer †, who ſeems to conſider them as under the ſame miſtake, "that their theory of morals has no tendency to weaken the foundations of virtue; and that by the account which it gives of the riſe of the ſocial affections, it obviates many of the arguments which had formerly been urged againſt the ſelfiſh ſyſtem." Nay, we ſcruple not to confeſs, that the mode of inveſtigation which it employs in *all caſes* to diſcover the will of God, may in *ſome caſes* be neceſſary in any ſyſtem which does not baniſh the uſe of reaſon from the ſcience of ethics. On this account, as well as out of reſpect to the firſt moraliſt ‡ of the age, who affirms, that "it muſt be embraced by all who are willing to know why they act, or why they forbear, to give any reaſon of their conduct to themſelves or to others," we ſhall apply it to one of theſe caſes of ſocial duty which Mr Hume's principle of utility could not reſolve. Such an example will enable the meaneſt of our readers to decide between the merits of it and of the theory which we ſhall adopt; or, as we rather hope, it will ſhow them that the two theories lead to the ſame practical concluſions.

† Stuart's Elements of the Philoſophy of the Human Mind.

‡ Johnſon.

Having thus given our readers a ſhort view of the moſt celebrated ſyſtems of ethics which have prevailed from the earlieſt ages of the world to the preſent day, we now proceed, agreeably to our definition of the ſcience, to trace man's duty from his nature and connections, and to ſhow that the ſteady practice of virtue muſt terminate in his ultimate happineſs.

PART I.

CHAP. I. *Of* MAN *and his* CONNECTIONS.

20 Man's infant ſtate.

MAN is born a weak, helpleſs, delicate creature, unprovided with food, clothing, and whatever elſe is neceſſary for ſubſiſtence or defence. And yet, expoſed as the infant is to numberleſs wants and dangers, he is utterly incapable of ſupplying the *former*, or ſecuring himſelf againſt the *latter*. But, though thus feeble and expoſed, he finds immediate and ſure reſources in the *affection* and *care* of his parents, who refuſe no labours, and forego no dangers, to nurſe and rear up the tender babe. By theſe powerful inſtincts, as by ſome mighty chain, does nature link the *parent* to the *child*, and form the ſtrongeſt *moral connection* on his part, before the child has the leaſt apprehenſion of it. *Hunger* and *thirſt*, with all the ſenſations that accompany or are connected with them, explain themſelves by a language ſtrongly expreſſive, and irreſiſtibly moving. As the ſeveral ſenſes bring in notices and informations of ſurrounding objects, we may perceive in the young ſpectator early ſigns of a growing *wonder* and *admiration*. Bright objects and ſtriking ſounds are beheld and heard with a ſort of commotion and ſurpriſe. But, without reſting on any, he eagerly paſſes on from object to object, ſtill pleaſed with whatever is moſt new. Thus the *love* of *novelty* is formed, and the paſſion of *wonder* kept awake. By degrees he becomes acquainted with the moſt familiar objects, his parents, his brethren, and thoſe of the family who are moſt converſant with him. He contracts a *fondneſs* for them, is uneaſy when they are gone, and charmed to ſee them again. Theſe feelings become the foundation of a *moral attachment* on his ſide; and by this reciprocal ſympathy he forms the domeſtic alliance with his parents, brethren, and other members of the family. Hence he becomes intereſted in their concerns; and feels *joy* or *grief*, *hope* or *fear*, on their account, as well as his own. As his affections now point beyond himſelf to others, he is denominated a *good* or *ill* creature, as he ſtands *well* or *ill affected* to them. Theſe, then, are the firſt links of the *moral chain*; the early rudiments, or outlines, of his character; his firſt rude eſſays towards agency, freedom, manhood.

21 His childhood.

When he begins to make excurſions from the nurſery, and extends his acquaintance abroad, he forms a little circle of companions; engages with them in play, or in queſt of adventures; and leads, or is led by them, as his genius is more or leſs aſpiring. Though this is properly the ſeaſon in which *appetite* and *paſſion* have the *aſcendant*, yet his *imagination* and *intellectual* powers open apace; and as the various images of things paſs before the mental eye, he forms variety of taſtes; reliſhes ſome things, and diſlikes others, as his parents, companions, and a thouſand other circumſtances, lead him to combine agreeable or diſagreeable ſets of ideas, or repreſent to him objects in alluring or odious lights.

As his views are enlarged, his *active* and *ſocial* powers expand themſelves in proportion; the *love of action*, of *imitation*, and of *praiſe*, *emulation*, *curioſity*, *docility*, *a paſſion for command*, and *fondneſs of change*.—His paſſions are quick, variable, and pliant to every impreſſion; his attachments and diſguſts quickly ſucceed each other. He compares things, diſtinguiſhes actions, judges of characters, and loves or hates them, as they appear well or ill affected to himſelf, or to thoſe he holds dear. Mean while he ſoon grows ſenſible of the conſequences of his own actions, as they attract applauſe, or bring contempt: he triumphs in the former; and is aſhamed of the latter, wants to hide them, and bluſhes when they are diſcovered. By means of theſe powers he becomes a fit ſubject of culture, the moral tie is drawn cloſer, he feels that he is accountable for his conduct to others as well as to himſelf, and thus is gradually ripening for ſociety and action.

22 His youth.

As man advances from *childhood* to *youth*, his paſſions as well as perceptions take a more extenſive range. New ſenſes of pleaſure invite him to new purſuits; he grows ſenſible to the attractions of beauty, feels a peculiar ſympathy with the ſex, and forms a more tender kind of attachment than he has yet experienced. This becomes the cement of a *new moral relation*, and gives a ſofter turn to his paſſions and behaviour. In this turbulent period he enters more deeply into a *reliſh of friendſhip*, *company*, *exerciſes*, and *diverſions*; the *love of truth*, of *imitation*, and of *deſign*, grows upon him; and as his connections ſpread among his neighbours, fellow-citizens, and countrymen,

trymen, his *thirſt of praiſe*, *emulation*, and *ſocial affections* grow more intenſe and active. Mean while, it is impoſſible for him to have lived thus long without having become ſenſible of thoſe more auguſt ſignatures of order, wiſdom, and goodneſs, which are ſtamped on the viſible creation; and of thoſe ſtrong ſuggeſtions within himſelf of a parent mind, the ſource of all intelligence and beauty; an object as well as ſource of that activity, and thoſe aſpirations which ſometimes rouſe his inmoſt frame, and carry him out of himſelf to an almighty and all governing power: Hence ariſe thoſe ſentiments of *reverence*, and thoſe affections of *gratitude*, *reſignation*, and *love*, which link the ſoul with the Author of Nature, and form that moſt ſublime and god-like of all connections.

23 His manhood.

Man having now reached his prime, either new paſſions ſucceed, or the old ſet are wound up to an higher pitch. For, growing more ſenſible of his connections with the public, and that particular community to which he more immediately belongs; and taking withal a larger proſpect of human life, and its various wants and enjoyments; he forms more intimate friendſhips, graſps at power, courts honour, lays down cooler plans of intereſt, and becomes more attentive to the concerns of ſociety: he enters into family connections, and indulges thoſe charities which ariſe from thence. The *reigning* paſſions of this period powerfully prompt him to provide for the decays of life; and in it *compaſſion* and *gratitude* exert their influence in urging the *man*, now in full vigour, to requite the affection and care of his parents, by ſupplying their wants, and alleviating their infirmities.

24 Old age.

At length human life verges downwards; and *old age* creeps on apace, with its *anxiety*, *love of eaſe*, [illegible], *fearfulneſs*, *foreſight*, and *love of offspring*. —The experience of the aged is formed to direct, and their coolneſs to temper, the heat of youth: the former teaches them to look back on paſt follies; and, the latter to look forward into the conſequences of things, and provide againſt the worſt. Thus every age has its peculiar genius and ſet of paſſions correſponding to that period, and moſt conducive to the proſperity of the reſt. And thus are the *wants* of one period ſupplied by the *capacities* of another, and the *weakneſſes* of one age tally to the *paſſions* of another.

25 Paſſions of every age.

Beſides theſe, there, are other paſſions and affections of a leſs *ambulatory* nature, not peculiar to one period, but belonging to every age, and acting more or leſs in every breaſt throughout life. Such are *ſelf-love*, *benevolence*, *love of life*, *honour*, *ſhame*, *hope*, *fear*, *deſire*, *averſion*, *joy*, *ſorrow*, *anger*, and the like. The two firſt are affections of a cooler ſtrain; one pointing to the good of the individual, the other to that of the ſpecies: *joy* and *ſorrow*, *hope* and *fear*, ſeem to be only modifications, or different exertions, of the ſame *original* affections of *love* and *hatred*, *deſire* and *averſion*, ariſing from the different circumſtances or poſition of the object deſired or abhorred, as it is preſent or abſent. From theſe likewiſe ariſe other *ſecondary* or *occaſional* paſſions, which depend, as to their exiſtence and ſeveral degrees, upon the original affections being gratified or diſappointed; as *anger*, *complacence*, *confidence*, *jealouſy*, *love*, *hatred*, *dejection*, *exultation*, *contentment*, *diſguſt*, which do not form *laſting* paſſions, but rather hold of them.

26 Their joint effects.

By theſe ſimple but powerful ſprings, whether *periodical* or *fixed*, the life of man, weak and indigent as he is, is preſerved and ſecured, and the creature is prompted to a conſtant round of action, even to ſupply his own numerous and ever returning *wants*, and to guard againſt the various *dangers* and *evils* to which he is obnoxious. By theſe links men are connected with each other, formed into families, drawn into particular communities, and all united as by a common league into one ſyſtem or body, whoſe members feel and ſympathiſe one with another. By this admirable adjuſtment of the conſtitution of *man* to his *ſtate*, and the gradual evolution of his powers, order is maintained, ſociety upheld, and human life filled with that variety of paſſion and action which at once enliven and diverſify it.

27 The directing power.

This is a ſhort ſketch of the *principal movements* of the human mind. Yet theſe movements are not the whole of man; they impel to action, but do not direct it: they need a *regulator* to guide their motions, to meaſure and apply their forces; and accordingly they have one that naturally *ſuperintends* and *directs* their action. We are conſcious of a principle within us, which examines, compares, and weighs things; notes the differences, obſerves the forces, and foreſees the conſequences, of affections and actions. By this power we look back on paſt times, and forward into futurity, gather experiences, eſtimate the real and comparative value of objects, lay out ſchemes, contrive means to execute them, and ſettle the whole order and œconomy of life. This power we commonly diſtinguiſh by the name of *reaſon* or *reflection*, the buſineſs of which is not to ſuggeſt any original notices or ſenſations, but to canvaſs, range, and make deductions from them.

28 The judging or approving powers.

We are intimately conſcious of another principle within us, which approves of certain *ſentiments*, *paſſions*, and *actions*, and diſapproves of their contraries. In conſequence of the deciſions of this inward judge, we denominate ſome actions and principles of conduct *right*, *honeſt*, *good*; and others *wrong*, *diſhoneſt*, *ill*. The former excite our *eſteem*, *moral complacence*, and *affection*, immediately and originally of themſelves, without regard to their conſequences, and whether they affect our intereſt or not. The latter do as naturally and neceſſarily call forth our *contempt*, *ſcorn*, and *averſion*. That power by which we perceive this difference in affections and actions, and feel a conſequent reliſh or diſlike, is commonly called *conſcience* or the *moral ſenſe*.

That there is ſuch a power as this in the mind of every man of ſound underſtanding, is a fact which cannot be controverted; but whether it be an inſtinctive power, or the reſult of early and deep rooted aſſociations, has been long and ably debated. The queſtion is of importance in the ſcience of human nature, as well as in aſcertaining the ſtandard of practical virtue; but to us it appears that the contending parties have carried their reſpective opinions to dangerous extremes.

When it is affirmed, as it ſometimes has been, that reaſon has nothing to do in ethical ſcience, but that in every poſſible ſituation our duty is pointed out and the performance of it enforced by mere ſentiment, the conſequence ſeems to be, that virtue and vice are no-

29 An attempt to prove that we have from nature no ſuch powers,

thing permanent in themſelves, but change their nature according to local circumſtances. Certain it is, that ſentiment has in ſimilar ſituations approved of very different practices in different ages and different nations. At preſent this ſentiment in Europe approves of the univerſal practice of juſtice, and of parents protecting their children, whether well or ill formed, whether ſtrong or weak: but in Sparta we know that theft, if dexterouſly practiſed, was approved, and not unfrequently rewarded; and that the expoſition of lame and deformed children was not only permitted but abſolutely enjoined. There is nothing which our conſcience or moral ſenſe condemns with greater ſeverity, or views as a crime of a deeper dye, than childrens unkind treatment of their aged parents; yet there are ſavages among whom inſtincts of all kinds ought to prevail in greater purity than in civilized nations, whoſe moral ſenſe permits them to put their aged and decrepid parents to death. If this ſenſe be inſtinctive, and the ſole judge of right and wrong, how comes it to decide ſo differently on the ſame line of conduct in different ages and diſtant countries? The inſtincts of brutes, in ſimilar circumſtances, prompt uniformly to ſimilar actions in every age and in every region where the ſpecies is found; and the external ſenſes of man afford in all nations the ſame unvaried evidence concerning their reſpective objects. To theſe obſervations we may add, that inſtincts muſt be calculated for the ſtate of nature, whatever that ſtate may be, and therefore cannot be ſuppoſed capable of directing our ſteps through all the labyrinths of poliſhed ſociety, in which duties are to be performed that in a ſtate of nature would never have been thought of.

But though for theſe reaſons it is apparent that mere ſentiment, whether called conſcience or the moral ſenſe, would *alone* be a very unſafe guide to virtue in every individual caſe that may occur, we think that thoſe who reſolve all ſuch ſentiment into habit and the effect of education, without giving any part of it to nature, advance an opinion which is equally ill-founded and not leſs dangerous. There are, indeed, men who affirm that all benevolence is hypocriſy, friendſhip a cheat, public ſpirit a farce, fidelity a ſnare to procure truſt and confidence; and that while all of us at bottom purſue only our private intereſt, we wear thoſe fair diſguiſes, in order to put thoſe off their guard with whom we have to deal, and to expoſe them the more to our wiles and machinations. Others again, too virtuous to accuſe themſelves and all mankind of direct knavery, yet inſiſt, that whatever affection one may feel, or imagine he feels, for others, no paſſion is or can be diſintereſted; that the moſt generous friendſhip, however ſincere, is only a modification of ſelf-love; and that even unknown to ourſelves we ſeek only our own gratification, while we appear the moſt deeply engaged in ſchemes for the liberty and happineſs of mankind.

30 Examined and ſhown.

Surely the mildeſt of theſe repreſentations is an exaggerated picture of the ſelfiſhneſs of man. Self-love is indeed a very powerful as well as an eſſential principle in human nature; but that we had likewiſe an inſtinctive principle of benevolence, which, without any particular regard to our own intereſt, makes us feel pleaſure in the happineſs of other men, is a fact which we think admits of very complete proof. For, as Mr Hume well argues, "when a man grieves for a friend who could be of no ſervice to him, but on the contrary ſtood in need of his conſtant patronage and protection, how it is poſſible to ſuppoſe that ſuch paſſionate tenderneſs ariſes from ſelf intereſt, which has no foundation in nature? What intereſt (aſks the ſame deep thinker) can a fond mother have in view, who loſes her health by her aſſiduous attendance on her ſick child, and afterwards languiſhes and dies of grief when freed by its death from the ſlavery of attendance? — Have we no ſatisfaction (continues he) in one mans company above another's, and no deſire of the welfare of our friend, even though abſence or death ſhould prevent us from all participation in it? Or what is it commonly that gives us any participation in it, even while alive and preſent, but our affection and regard to him?" Nor is it to contemporaries and individuals alone, that, independant of all intereſt, we feel a benevolent attachment. We conſtantly beſtow praiſe on actions calculated to promote the good of mankind, thoughp erformed in ages very diſtant and in countries moſt remote; and he who was the author of ſuch actions is the object of our eſteem and affection. There is not perhaps a man alive, however ſelfiſh in his diſpoſition who does not applaud the ſentiment of that emperor, who, recollecting at ſupper that he had done nothing in that day for any one, exclaimed with regret, that the day had been loſt! yet the utmoſt ſubtility of imagination can diſcover no appearance of intereſt that *we* can have in the generoſity of *Titus*, or find any connection of our preſent happineſs with a character removed ſo far from us both in time and in place. But, as Mr Hume juſtly obſerves, if we even feign a character conſiſting of all the moſt generous and beneficent qualities, and give inſtances in which theſe diſplay themſelves, after an eminent and moſt extraordinary manner, for the good of mankind, we ſhall inſtantly engage the eſteem and approbation of all our audience, who will never ſo much as inquire in what age or country the accompliſhed perſon lived.

Theſe are facts which cannot be controverted; and they are wholly unaccountable, if there be not in human nature an inſtinctive ſentiment of benevolence or ſympathy, which feels a diſintereſted pleaſure in the happineſs of mankind. But an end in which we feel pleaſure we are naturally prompted to purſue; and therefore the ſame ſentiment impels every man, with greater or leſs force, to promote the happineſs of other men, which by means of it becomes in reality his own good, and is afterwards purſued from the combined motives of benevolence and ſelf-enjoyment. For in obeying this ſentiment we all feel an inward *complacency*, *ſelf-approbation*, or conſciouſneſs of *worth* or *merit*; and in diſobeying it, which cannot be done but with reluctance, we feel *remorſe*, or a conſciouſneſs of *unworthineſs* or *demerit*. It appears, however, from hiſtory, that the ſentiment, as it is inſtinctive, points only to the good of mankind, without informing us how that good is to be promoted. The means proper for this purpoſe muſt be diſcovered by reaſon; and when they are brought into view, this *ſentiment*, *conſcience*, or *moral ſenſe*, inſtantly ſhows us that it is our duty to purſue them.

Hence we ſee how different lines of conduct may in ſimilar circumſtances be approved of as virtuous in different nations. When the Spartan expoſed his ſickly and deformed child, and when the ſavage put his aged parents to death, neither of them erred from want of ſentiment, or from having ſentiments originally different from ours. Their errors reſulted from a defect in reaſoning. They both imagined that they were obeying the law of benevolence by preventing miſery; for a weak and deformed perſon was very ill qualified to exiſt with any degree of comfort under the military conſtitution of Sparta, where all were ſoldiers, and under the neceſſity of undergoing the greateſt hardſhips; and in a ſtate where the people have no fixed habitations, and where the chace ſupplies even the neceſſaries of life, an aged and infirm perſon is in danger of periſhing through hunger, by one of the cruelleſt and moſt lingering of deaths. The theft allowed in Sparta, if theft it may be called, was a ſtill leſs deviation from the inſtinctive law of benevolence. Boys were taught to ſlip as cunningly as they could into the gardens and public halls, in order to ſteal away herbs or meat; and if they were caught in the fact, they were puniſhed for their want of dexterity. This kind of theft, ſince it was authoriſed by the law and the conſent of the citizens, was no robbery; and the intention of the legiſlator in allowing it, was to inſpire the Spartan youth, who were all deſigned for war, with the greater boldneſs, ſubtlety, and addreſs; to enure them betimes to the life of a ſoldier; and to teach them to ſhift for themſelves, and to live upon little. That the Spartan legiſlator did wrong in giving his countrymen a conſtitution, of which ſucceſsful war was the ultimate object: and that ſavages, rather than kill their aged parents, or ſuffer them to die of hunger, ought to cultivate the ground; and abandon the chace, is readily granted; but the faults of the one as well as of the other aroſe not from any improper deciſion of the moral ſenſe, but from a defect in their reaſoning powers, which were not able to eſtimate the advantages and diſadvantages of different modes of life. In moral deciſions, therefore, conſcience and reaſon are aiding to each other. The former principle, when ſeparated from the latter, is defective, enjoining only the good of mankind, but unable to point out the means by which it can be moſt effectually promoted: and the latter principle, when ſeparated from the former, only directs a man to do what is moſt prudent, but cannot give him a conception of duty.

31
To originate in the objector's miſtaking the extent of thoſe powers;

32
Which are different in nature and kind from the paſſions and affections.

These two powers of *reaſon* and *conſcience* are evidently principles different in *nature* and *kind* from the paſſions and affections. For the paſſions are mere *force* or *power*, *blind impulſes*, acting violently and without choice, and ultimately tending each to their reſpective objects, without regard to the intereſt of the others, or of the whole ſyſtem. Whereas the *directing* and *judging* powers diſtinguiſh and aſcertain the different forces, mutual proportions and relations, which the paſſions bear to each other and to the whole; recogniſe their ſeveral degrees of merit, and judge of the whole temper and conduct, as they reſpect either the individual or the ſpecies; and are capable of directing or reſtraining the blind impulſes of paſſion in a due conſiſtency one with the other, and a regular ſubordination to the whole ſyſtem.

This is ſome account of the *conſtituent principles* of our nature, which, according to their different mixtures, degrees, and proportions, mould our character and ſway our conduct in life. In reviewing that large train of affections which fill up the different ſtages of human life, we perceive this obvious diſtinction among them; that ſome of them reſpect the *good* of the *individual*, and others carry us beyond ourſelves to the *good* of the *ſpecies* or *kind*. The former have therefore been called *private*, and the latter *public* affections. Of the firſt ſort are *love of life*, of *pleaſure*, of *power*, and the like. Of the laſt are *compaſſion*, *gratitude*, *friendſhip*, *natural affection*, and the like. Of the *private* paſſions (B), ſome reſpect merely the *ſecurity* and *defence* of the creature, ſuch as *reſentment* and *fear*; whereas others aim at ſome *poſitive* advantage or good, as *wealth eaſe ſame*. The former ſort, therefore, becauſe of this difference of objects, may be termed *defenſive* paſſions. Theſe anſwer to our *dangers*, and prompt us to avoid them if we can, or boldly to encounter them when we cannot.

33
Diviſion of the paſſions

34
Defenſive paſſions.

35
Private or appetitive paſſions.

The other claſs of *private* paſſions, which purſue *private poſitive* good, may be called *appetitive*. However, we ſhall ſtill retain the name of *private* in contradiſtinction to the *defenſive* paſſions. Man has a great variety of wants to ſupply, and is capable of many enjoyments, according to the ſeveral periods of life, and the different ſituations in which he is placed. To theſe therefore a ſuitable train of *private* paſſions correſpond, which engage him in the purſuit of whatever is neceſſary for his ſubſiſtence or welfare.

36
Public paſſions.

Our *public* or *ſocial* affections are adapted to the ſeveral *ſocial connections* and *relations* which we bear to others, by making us ſenſible of their dangers, and intereſting us in their wants, and ſo prompting us to ſecure them againſt one and ſupply the other.

This is the firſt ſtep then to diſcover the *duty* and *deſtination* of man, the having analyſed the principles of which he is compoſed. It is neceſſary, in the next place, to conſider in what *order*, *proportion*, and *meaſure* of thoſe inward principles, *virtue*, or a ſound moral temper and right conduct, conſiſts; that we may diſcover whence *moral obligation* ariſes.

CHAP. II. *Of* DUTY, *or* MORAL OBLIGATION.

37
The meaſure of powers.

It is by the end or deſign of any power or movement that we muſt direct its motions, and eſtimate the degree of force neceſſary to its juſt action. If it want the force requiſite for the obtaining its end, we reckon it defective; if it has too much, ſo as to be carried beyond it, we ſay it is overcharged; and in either caſe it is imperfect and ill-contrived. If it has juſt enough to reach the ſcope, we eſteem it right and as it ſhould be. Let us apply this reaſoning to the paſſions.

38
Meaſure of the defenſive paſſions.

The *defence* and *ſecurity* of the individual being the *aim* of the *defenſive paſſions*, that *ſecurity* and *defence* muſt be the meaſure of their *ſtrength* or *indulgence*. If they are ſo *weak* as to prove inſufficient for that end, or if they *carry us beyond it*, i. e. raiſe unneceſſary commotions, or continue longer than is needful, they are unfit to anſwer their original deſign, and therefore are in an unſound and unnatural ſtate. The exerciſe of *fear* or of *reſentment* has nothing deſirable in it; nor can

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(B) Here we uſe paſſions and affections without diſtinction. Their difference will be marked afterwards.

Of Moral Obligation.

can we give way to either without painful ſenſations. Without a certain degree of them, we are naked and expoſed. With too high a proportion of them, we are miſerable, and often injurious to others. Thus *cowardice* or *timidity*, which is the exceſs of fear, inſtead of ſaving us in danger, gives it too formidable an appearance, makes us incapable of attending to the beſt means of preſervation, and diſarms us of *courage*, our natural armour. *Fool-hardineſs*, which is the want of a due meaſure of *fear*, leads us heedleſsly into danger, and lulls us into a pernicious ſecurity. *Revenge*, i. e. *exceſſive reſentment*, by the violence of its commotion, robs us of the *preſence of mind* which is often the beſt guard againſt injury, and inclines us to purſue the aggreſſor with more ſeverity than ſelf-defence requires. *Puſillanimity*, or the want of a juſt indignation againſt wrong, leaves us quite unguarded, and tends to ſink the mind into a paſſive enervated tameneſs. Therefore, "to keep the defenſive paſſions duly proportioned to our dangers, is their natural pitch and tenor."

39 Meaſure of the private paſſions.

The *private* paſſions lead us to purſue ſome *poſitive* ſpecies of *private* good: that *good* therefore which is the object and end of each muſt be the meaſure of their reſpective force, and direct their operation. If they are too *weak* or *ſluggiſh* to engage us in the purſuit of their ſeveral objects, they are evidently *deficient*; but if they defeat their end by their *impetuoſity*, then are they ſtrained beyond the juſt tone of nature. Thus *vanity*, or an *exceſſive paſſion for applauſe*, betrays into ſuch meanneſſes and little arts of popularity, as makes us forfeit the honour we ſo anxiouſly court. On the other hand, *a total indifference about the eſteem of mankind*, removes a ſtrong guard and ſpur to virtue, and lays the mind open to the moſt abandoned proſecutions. Therefore, "to keep our private paſſions and deſires proportioned to our *wants*, is the juſt meaſure and pitch of this claſs of affections."

40 Comparative force.

The *defenſive* and *private* paſſions do all agree in general, in their tendency or conduciveneſs to the intereſt or good of the individual. Therefore, when there is a colliſion of intereſt, as may ſometimes happen, that *aggregate of good* or *happineſs*, which is compoſed of the particular goods to which they reſpectively tend, muſt be the common ſtandard by which their *comparative degrees* of ſtrength are to be meaſured: that is to ſay, if any of them, in the degree in which they prevail, are incompatible with the greateſt aggregate of good or moſt extenſive intereſt of the individual, then are they unequal and diſproportionate. For in judging of a particular *ſyſtem* or *conſtitution* of powers, we call that the *ſupreme* or *principal* end in which the aims of the ſeveral parts or powers coincide, and to which they are ſubordinate; and reckon them in due proportion to each other, and right with regard to the whole, when they maintain that ſubordination of ſubſerviency. Therefore, "to proportion our defenſive and private paſſions in ſuch meaſure to our dangers and wants as beſt to ſecure the individual, and obtain the greateſt aggregate of private good or happineſs, is their juſt balance or comparative ſtandard in caſe of competition."

41 Meaſure of the public affections.

In like manner as the *public* or *ſocial* affections point at the good of others, that *good* muſt be the meaſure of their force. When a particular *ſocial* affection, as *gratitude* or *friendſhip*, which belongs to a particular *ſocial connection*, *viz*. that of a *benefactor* or of a *friend*, is too feeble to make us act the *grateful* or *friendly* part, that affection, being inſufficient to anſwer its end, is *defective* and *unſound*. If, on the other hand, a particular paſſion of this claſs counteract or defeat the intereſt it is deſigned to promote, by its violence or diſproportion, then is that paſſion *exceſſive* and *irregular*. Thus *natural affection*, if it degenerates into a *paſſionate* fondneſs, not only hinders the parents from judging coolly of the intereſt of their offspring, but often leads them into a moſt partial and pernicious indulgence.

42 Colliſion of ſocial affections.

As every kind affection points at the good of its particular object, it is poſſible there may be ſometimes a colliſion of intereſts or goods. Thus the regard due to a *friend* may interfere with that which we owe to a *community*. In ſuch a competition of intereſts, it is evident that the *greateſt* is to be choſen; and that is the greateſt intereſt which contains the greateſt ſum or aggregate of public good, greateſt in *quantity* as well as *duration*. This then is the *common ſtandard* by which the reſpective forces and ſubordinations of the ſocial affections muſt be adjuſted. *Therefore* we conclude, that "this claſs of affections are ſound and regular when they prompt us to purſue the *intereſt* of *individuals* in an entire conſiſtency with the *public good*;" or, in other words, "when they are duly proportioned to the *dangers* and *wants* of others, and to the various *relations* in which we ſtand to *individuals* or to *ſociety*."

Thus we have found, by an induction of particulars, the *natural pitch* or *tenor* of the *different orders of affection*, conſidered apart by themſelves. Now, as the *virtue* or *perfection* of every creature lies in following its nature, or acting ſuitably to the juſt proportion and harmony of its ſeveral powers; therefore, "the VIRTUE of a creature endowed with ſuch affections as *man* muſt conſiſt in obſerving or acting agreeably to their *natural pitch and tenor*."

43 Balance of affection.

But as there are no independent affections in the fabric of the mind, no paſſion that ſtands by itſelf, without ſome relation to the reſt, we cannot pronounce of any one, conſidered APART, that it is either *too ſtrong* or *too weak*. Its ſtrength and juſt proportion muſt be meaſured not only by its ſubſerviency to its own immediate end, but by the reſpect it bears to the whole ſyſtem of affection. Therefore, we ſay a paſſion is *too ſtrong*, not only when it defeats its own end, but when it impairs the force of other paſſions, which are equally neceſſary to form a *temper of mind* ſuited to a certain *economy* or *ſtate*; and too weak, not merely on account of its inſufficiency to anſwer its end, but becauſe it cannot ſuſtain its *part* or *office* in the balance of the whole ſyſtem. Thus the *love of life* may be *too ſtrong* when it takes from the *regard* due to one's country, and will not allow one bravely to encounter dangers, or even death, on its account. Again, the *love of fame* may be *too weak* when it throws down the fences which render virtue more ſecure, or weakens the incentives which make it more active and public ſpirited.

44 Limits of private affections.

If it be aſked, "How far may the affections towards private good or happineſs be indulged?" One limit was before fixed for the particular indulgence of each, *viz*. their ſubordination to the common aggregate of good to the private ſyſtem. In theſe therefore a due regard is always ſuppoſed to be had to *health*, *reputation*, *fortune*, the *freedom of action*, the *unimpaired exerciſe of reaſon*, the *calm enjoyment of one's ſelf*, which are all private goods. Another limit now reſults from the balance of affection juſt named, *viz.* “The ſecurity and happineſs of others;” or, to expreſs it more generally, “a *private* affection may be ſafely indulged, when, by that indulgence, we do not violate the obligations which reſult from our higher relations or public connections.” A juſt reſpect therefore being had to theſe boundaries which nature has fixed in the breaſt of every man, what ſhould limit our purſuits of private happineſs? Is nature ſullen and penurious? or, does the God of nature envy the happineſs of his offſpring?

45 Colliſion of intereſts.

Whether there is ever a real colliſion of intereſts between the *public* and *private* ſyſtem of affections, or the ends which each claſs has in view, will be afterwards conſidered; but where there is no colliſion, there is little or no danger of carrying either, but eſpecially the *public* affections, to exceſs, provided both kinds are kept ſubordinate to a diſcreet and cool *ſelf-love*, and to a calm and univerſal *benevolence*, which principles ſtand as guards at the head of each ſyſtem.

46 Reſult.

This then is the conduct of the paſſions, conſidered as *particular* and *ſeparate* forces, carrying us out to their reſpective ends; and this is their balance or œconomy, conſidered as *compound* powers, or powers mutually related, acting in conjunction towards a *common* end, and conſequently as forming a *ſyſtem* or *whole*.

47 Subordination of powers.

Now, whatever adjuſts or maintains this *balance*, whatever in the human conſtitution is formed for *directing* the paſſions ſo as to keep them from defeating their own end or interfering with each other, muſt be a principle of a *ſuperior* nature to them, and *ought* to direct their meaſures and govern their proportion. But it was found that *reaſon* or reflection is ſuch a principle, which points out the tendency of our paſſions, weighs their influence upon private and public happineſs, and ſhows the beſt means of attaining either. It having been likewiſe found that there is another directing or controling principle, which we call CONSCIENCE or the MORAL SENSE, which, by a native kind or authority, judges of affections and actions, pronouncing ſome *juſt* and *good*, and others *unjuſt* and *ill*; it follows, that the paſſions, which are mere impulſe or blind forces, are principles inferior and ſubordinate to this *judging* faculty. Therefore, if we would follow the order of nature, *i. e.* obſerve the mutual reſpects and the ſubordination which the different parts of the human conſtitution bear one to another, the paſſions ought to be ſubjected to the direction and authority of the *leading* or *controling* principles.

48 In what it conſiſts.

We conclude, therefore, from this *induction*, that “the *conſtitution* or *juſt œconomy* of *human nature* conſiſts in a regular *ſubordination* of the *paſſions* and *affections* to the *authority* of *conſcience* and the *direction* of *reaſon*.”

49 Oeconomy of nature, or right temper.

That *ſubordination* is *regular*, when the proportion formerly mentioned is maintained; that is to ſay, “when the *defenſive* paſſions are kept proportioned to our *dangers*; when the *private* paſſions are proportioned to our *wants*; and when the *public* affections are adapted to our *public connections*, and proportioned to the wants and dangers of others.”

But the *natural ſtate*, or the *ſound* and *vigorous conſtitution* of any creature, or the *juſt œconomy* of its powers, we call its *health* and *perfection*; and the acting agreeably to theſe, its *virtue* or *goodneſs*.

50 Human virtue and perfection.

Therefore, “the *health* and *perfection* of man muſt lie in the aforeſaid *ſupremacy* of *conſcience* and *reaſon*, and in the *ſubordination* of the paſſions to their *authority* and *direction*. And his *virtue* or *goodneſs* muſt conſiſt in acting agreeably to that *order* or *œconomy*.”

51 How conformable to reaſon.

That ſuch an ornament of the mind, and ſuch a conduct of its powers and paſſions, will ſtand the teſt of *reaſon*, cannot admit of any diſpute. For, upon a fair examination into the conſequences of things, or the relations and aptitudes of *means* to *ends*, *reaſon* evidently demonſtrates, and *experience* confirms it, that, “to have our *defenſive paſſions* duly proportioned to our *dangers*, is the ſureſt way to avoid or get clear of them, and obtain the ſecurity we ſeek after.—To proportion our *private paſſions* to our *wants*, is the beſt means to ſupply them;—and, to adapt our *public affections* to our *ſocial relations*, and the *good* of others, is the moſt effectual method of fulfilling *one*, and procuring the *other*.” In this ſenſe, therefore, *virtue* may be ſaid to be a “*conduct* conformable to *reaſon*,” as reaſon diſcovers an apparent *aptitude*, in ſuch an *order* and *œconomy* of powers and paſſions, to anſwer the end for which they are *naturally* formed.

52 Connection between affections and ends, not the idea of moral obligation.

If the idea of *moral obligation* is to be deduced merely from this *aptitude* or *connection* between certain paſſions, or a certain order and balance of paſſions, and certain ends obtained or to be obtained by them, then is *reaſon* or *reflection*, which perceives that aptitude or connection, the proper judge of *moral obligation*; and on this ſuppoſition it may be defined, as hath been done by ſome, the connection between the *affection* and the *end*, or, which is the ſame thing, between the *action* and the *motive*; for the *end* is the *motive* or the *final cauſe*, and the *affection* is the *action*, or its immediate natural cauſe. A man, from mere ſelf-love, may be induced to fulfil that obligation which is founded on the connection between the *defenſive* paſſions and their *ends*, or the *private* paſſions and their *ends*; becauſe in that caſe his own intereſt will prompt him to indulge them in the due proportion required. But if he has no affections which point beyond himſelf, no principle but *ſelf-love*, or ſome ſubtle modification of it, what ſhall intereſt him in the happineſs of others, where there is no connection between it and his own? or what ſenſe can he have of *moral obligation* to promote it? Upon this ſcheme, therefore, without public or ſocial affection there could be no *motive*, and conſequently no moral obligation, to a beneficent diſintereſted conduct.

But if the mere connection between certain paſſions, or a certain order of paſſions and certain ends, are what conſtitutes or gives us the idea of *moral obligation*, then why may not the appoſiteneſs of any temper or conduct, nay, of any piece of machinery, to obtain its end, form an equally ſtrict *moral obligation*? for the connection and aptitude are as ſtrong and invariable in the latter inſtances as in the former. But as this is confounding the moſt obvious differences of things, we muſt trace the idea of *moral obligation* to another and a more natural ſource.

53 Idea of it from experience.

Let us appeal, therefore, to our inmoſt ſenſe and experience, “how we ſtand affected to thoſe different ſets of paſſions, in the juſt meaſure and balance of which we found a right temper to conſiſt." For this is entirely a matter of experience, in which we muſt examine, as in any other natural inquiry, "what are the genuine feelings and operations of nature, and what affections or ſymptoms of them appear in the given inſtance."

54 Why the defenſive paſſions are approved.

The defenſive paſſions, as *anger* and *fear*, give us rather pain than pleaſure, yet we cannot help feeling them when provoked by injury, or expoſed to harm. We account the creature imperfect that wants them becauſe they are neceſſary to his defence. Nay, we ſhould in ſome meaſure condemn ourſelves, did we want the neceſſary degree of *reſentment* and *caution.* But if our *reſentment* exceeds the wrong received, or our *caution* the evil dreaded, we then blame ourſelves for having over-acted our part. Therefore, while we are in danger, to be totally deſtitute of them we reckon a *blameable defect*, and to feel them in a juſt *i. e.* neceſſary meaſure, we *approve*, as ſuited to the nature and condition of ſuch a creature as man. But our ſecurity obtained, to continue to indulge them, we not only *diſapprove* as *hurtful*, but *condemn* as *unmanly, unbecoming*, and *unſpirited:* Nor will ſuch a conduct afford any ſelf-approving joy when we coolly reflect upon it.

55 Why the private.

With regard to the *private* paſſions, ſuch as *love of life, pleaſure, eaſe*, and the like, as theſe aim at private good, and are neceſſary to the perfection and happineſs of the individual, we ſhould reckon any creature *defective*, and even *blameable*, that was deſtitute of them. Thus, we condemn the man who imprudently ruins his fortune, impairs his health, or expoſes his life; we not only pity him as an unfortunate creature, but feel a kind of *moral indignation* and contempt of him, for having made himſelf ſuch. On the other hand, though a diſcreet ſelf-regard does not attract our eſteem and veneration, yet we approve of it in ſome degree, in an higher and different degree from what we would regard a well-contrived machine as neceſſary to conſtitute a finiſhed creature, nay, to complete the virtuous character, as exactly ſuited to our preſent indigent ſtate. There are ſome paſſions reſpecting private good, towards which we feel higher degrees of approbation, as the *love of knowledge*, of *action*, of *honour*, and the like. We eſteem them as marks of an ingenious mind: and cannot help thinking the character in which they are wanting remarkably ſtupid, and in ſome degre *immoral.*

56 Why the public.

With regard to the ſocial affections, as *compaſſion, natural affection, friendſhip, benevolence*, and the like, we approve, admire, and love them in ourſelves; and, in all in whom we diſcover them, with an eſteem and approbation, if not different in kind, yet ſurely far ſuperior in degree, to what we feel towards the other paſſions. Theſe we reckon neceſſary; juſt, and excellently fitted to our ſtructure and ſtate; and the creature which wants them we call defective, ill conſtituted, a kind of abortion. But the *public* affections we eſteem as ſelf-worthy, originally and externally amiable.

57 Diſtinction between vehement and calm affections.

But among the *ſocial* affections we make an obvious and conſtant diſtinction, viz. between thoſe particular paſſions which urge us with a ſudden violence, and uneaſy kind of ſenſation, to purſue the good of their reſpective objects, as *pity, natural affection*, and the like; and thoſe calm diſpaſſionate affections and deſires which prompt us more ſteadily and uniformly to promote the happineſs of others. The former we generally call *paſſions*, to diſtinguiſh them from the other ſort, which go more commonly by the name of *affections* or *calm deſires.* The firſt kind we approve indeed, and delight in; but we feel ſtill higher degrees of approbation and moral complacence towards the *laſt*, and towards all limitation of the particular inſtincts, by the principle of *univerſal benevolence.* The more objects the calm affections take in, and the worthier theſe are, their dignity riſes in proportion, and with this our approbation keeps in exact pace. A character, on the other hand, which is quite diveſted of theſe public affections, which feels no love for the ſpecies, but inſtead of it entertains malice, rancour, and ill-will, we reckon totally immoral and unnatural.

Such then are the ſentiments and diſpoſitions we feel when theſe ſeveral orders of affection paſs before the mental eye.

Therefore, "that ſtate in which we feel ourſelves moved, in the manner above deſcribed, towards thoſe affections and paſſions, as they come under the mind's review, and in which we are, inſtantaneouſly and independently of our choice or volition, prompted to a *correſpondent* conduct, we call a ſtate of *moral obligation.*" Let us ſuppoſe, for inſtance, a parent, a friend, a benefactor, reduced to a condition of the utmoſt indigence and diſtreſs, and that it is in our power to give them immediate relief. To what conduct are we *obliged?* what *duty* does nature dictate and require in ſuch a caſe? Attend to nature, and nature will tell, with a voice irreſiſtibly audible and commanding to the *human heart*, with an authority which no man can ſilence without being ſelf-condemned, and which no man can elude but at his peril, "that immediate relief *ought* to be given." Again, let a friend, a neighbour, or even a ſtranger, have lodged a *depoſit* in our hands, and after ſome time reclaim it; no ſooner do theſe ideas of the confidence repoſed in us, and of property not *transferred*, but *depoſited*, occur, than we immediately and unavoidably feel and recognize the *obligation* to reſtore it. In both theſe caſes we ſhould condemn and even loathe ourſelves if we acted otherwiſe, as having done, or omitted doing, what we *ought* not, as having acted beneath the dignity of our nature;—contrary to our moſt intimate ſenſe of *right* and *wrong:*—we ſhould accuſe ourſelves as guilty of ingratitude, injuſtice, and inhumanity,—and be conſcious of deſerving the cenſure, and therefore dread the reſentment, of all rational beings.—But in complying with the *obligation*, we feel joy and ſelf approbation,—are conſcious of an inviolable harmony between our nature and duty, and think ourſelves intitled to the applauſe of every impartial ſpectator of our conduct.

58 Moral obligation.

To *deſcribe* therefore what we cannot perhaps *define*, a ſtate of *moral obligation*, is "that ſtate in which a creature, endued with ſuch ſenſes, powers, and affections as man, would condemn himſelf, and think he deſerved the condemnation of all others, ſhould he refuſe to fulfil it; but would approve himſelf, and expect the approbation of all others, upon complying with it."

And we call him a MORAL AGENT, who is in ſuch a *ſtate*, or is ſubject to *moral obligation*.

59 Moral agent.

Therefore, as man's *ſtructure* and *connections* often ſubject him to ſuch a ſtate of *moral obligation*, we conclude that *he* is a *moral agent*.

60 Moral action good and bad.

But as man may ſometimes act without *knowing* what he does, as in caſes of *frenzy* or *diſeaſe*, or in many *natural functions*; or, knowing what he does, he may act without *choice* or *affection*, as in caſes of *neceſſity* or *compulſion*; therefore to denominate an action *moral*, i. e. *approveable*, or *blameable*, it muſt be done *knowingly* and *willingly*, or *from affection* and *choice*. "A *morally good action*, then, is to fulfil a *moral obligation* knowingly and willingly." And a *morally bad action* or an *immoral action*, is, "to violate a *moral obligation* knowingly and willingly."

61 Moral character and temper good and bad.

As not an *action*, but a *ſeries of actions*, conſtitute a *character*; as not an *affection* but a *ſeries of affections*, conſtitute a *temper*; and as we denominate things by the groſs, *à fortiori*, or by the qualities which chiefly prevail in them; therefore to call that a "*morally good character*, in which a *ſeries of morally good actions* prevail;" and that a "*morally good temper*, in which a *ſeries of morally good affections* have the aſcendant." A bad character and bad temper are the reverſe. But where the abovementioned *order* or *proportion* of paſſions is maintained, there a *ſeries* of *morally* good *affections and actions* will prevail. *Therefore*, "to maintain that order and proportion, is to have a *morally good temper and character*." But a "morally good temper and character is *moral rectitude*, *integrity*, *virtue*, or the *completion of duty*."

62 How we come by the idea of moral obligation.

If it be aſked after all, "how we come by the idea "of *moral obligation* or *duty*?" we may anſwer. That we come by it the ſame way as by our other *original* and *primary* perceptions. We receive them all from nature, or the great Author of nature. For this idea of *moral obligation* is not a creature of the mind, or dependent on any previous act of volition; but ariſes on certain occaſions, or when certain other ideas are preſented to the mind, as neceſſarily, inſtantaneouſly, and unavoidably, as *pain* does upon too near an approach to the fire, or *pleaſure* from the fruition of any good. It does not, for inſtance, depend on our choice, whether we ſhall feel the *obligation* to ſuccour a diſtreſſed parent, or to reſtore a depoſit intruſted to us when it is recalled. We cannot call this a *compound idea* made up of one or more ſimple ideas. We may indeed, nay we muſt, have ſome ideas antecedent to it, *e. g.* that of a parent—in diſtreſs—of a child—able to relieve—of the relation of one to the other—of a truſt—of right, &c. But none of theſe ideas conſtitute the perception of *obligation*. This is an idea quite diſtinct from, and ſomething ſuperadded to, the ideas of the correlatives, or the relation ſubſiſting between them. Theſe indeed, by a law of our nature, are the occaſion of ſuggeſting it; but they are as totally different from it as colours are from ſounds. By ſenſe of reflection we perceive the correlatives; our memory recalls the favours or depoſit we received; the various circumſtances of the caſe are matters of fact or experience; but ſome delicate inward *organ* or *power*, or call it what we pleaſe, does, by a certain inſtantaneous ſympathy, antecedent to the cool deductions of reaſon, and independent of previous inſtruction, art, or volition, *perceive the moral harmony*, the *living*, *irreſiſtible charms of moral obligation*, which immediately intereſts the correſpondent paſſions, and prompts us to fulfil its lawful dictates.

63 The uſe of reaſon in moral caſes

We need not apprehend any danger from the quickneſs of its deciſions, nor be frightened becauſe it looks like *inſtinct*, and has been called ſo. Would we approve one for deliberating long, or reaſoning the matter much at leiſure, whether he ſhould relieve a diſtreſſed parent, feed a ſtarving neighbour, or reſtore the truſt committed to him? ſhould we not ſuſpect the reaſoner of knavery, or of very weak affections to virtue? We employ *reaſon*, and worthily employ it, in examining the condition, relations, and other circumſtances of the agent or patient, or of thoſe with whom either of them are connected, or, in other words, the *ſtate of the caſe*: and in complicated caſes, where the circumſtances are many, it may require no ſmall attention to find the true ſtate of the caſe; but when the relations of the agent or patient and the circumſtances of the action are obvious, or come out ſuch after a fair trial, we ſhould ſcarce approve him who demurs on the obligation to that conduct which the caſe ſuggeſts.

64 Pleaſure, not the idea of obligation.

From what has been ſaid, it is evident, that it is not the pleaſure or agreeable ſenſations which accompany the exerciſe of the ſeveral affections, nor thoſe conſequent to the actions, that conſtitute *moral obligation*, or excite in us the idea of it. That pleaſure is poſterior to the idea of obligation; and frequently we are obliged, and acknowledge ourſelves under an obligation, to ſuch affections and actions as are attended with pain; as in the trials of virtue, where we are obliged to ſacrifice private to public good, or a preſent pleaſure to a future intereſt. We have pleaſure in ſerving an aged parent, but it is neither the perception nor proſpect of that pleaſure which gives us the idea of obligation to that conduct.

CHAP. III. *The* FINAL *Cauſes of our moral Faculties of* PERCEPTION *and* AFFECTION.

65 The ſurvey propoſed.

We have now taken a *general* proſpect of MAN and of his *moral powers* and *connections*, and on theſe erected a ſcheme of *duty*, or *moral obligation*, which ſeems to be confirmed by *experience*, conſonant to *reaſon*, and approved by his moſt inward and moſt ſacred *ſenſes*. It may be proper in the next place to take a more particular view of the *final cauſes* of thoſe delicate *ſprings* by which he is *impelled* to action, and of thoſe *clogs* by which he is reſtrained from it. By this detail we ſhall be able to judge of their aptitude to anſwer their end, in a creature endued with his *capacities*, ſubject to his *wants*, expoſed to his *dangers*, and ſuſceptible of his *enjoyments*; and from thence we ſhall be in a condition to pronounce concerning the *end* of his *whole ſtructure*, its *harmony*, with its *ſtate* and conſequently its ſubſerviency to anſwer the great and benevolent intentions of its author.

66 Inward anatomy of the ſyſtem of the mind.

The Supreme Being has ſeen fit to blend in the whole of things a prodigious variety of diſcordant and contrary principles, *light* and *darkneſs*, *pleaſure* and *pain*, *good* and *evil*. There are multifarious natures, *higher* and *lower*, and many intermediate ones between the wide-diſtant extremes. Theſe are differently ſituated, variouſly adjuſted, and ſubjected to each other, and all of them ſubordinate to the order and perfection of the whole. We may ſuppoſe *man* placed as in a centre amidſt thoſe innumerable orders of beings, by his *outward* frame drawing to the *material* ſyſtem, and by his *inward* connected with the INTELLECTUAL or *moral*, and of courſe affected by the laws which govern both, or affected by that good and that ill which reſult from thoſe laws. In this infinite variety of *relations* with which he is ſurrounded, and of *contingencies* to which he is liable, he feels ſtrong attractions to the *good*, and violent repulſions or averſions to the *ill*. But as good and ill are often blended, and wonderfully complicated one with the other; as they ſometimes immediately produce and run up into each other, and at other times lie at great diſtances, yet by means of intervening links introduce one another; and as theſe effects are often brought about in conſequence of hidden relations and general laws, of the energy of which he is an incompetent judge; it is eaſy for him to miſtake *good* for *evil*, and *evil* for *good*, and conſequently he may be frequently attracted by ſuch things as are deſtructive, or repel ſuch as are ſalutary. Thus, by the tender and complicated frame of his body, he is ſubjected to a great variety of ills, to *ſickneſs*, *cold*, *heat*, *fatigue*, and innumerable *wants*. Yet his knowledge is ſo narrow withal, and his reaſon ſo weak, that in many caſes he cannot judge, in the way of inveſtigation or reaſoning, of the connections of thoſe effects with their reſpective cauſes, or of the various latent energies of natural things.—He is therefore informed of this connection by the experience of certain *ſenſes* or *organs* of *perception*, which, by a mechanical inſtantaneous motion, feel the *good* and the *ill*, receiving pleaſure from *one*, and pain from the *other*. By theſe, without any reaſoning, he is taught to attract or chooſe what tends to his welfare, and to repel and avoid what tends to his ruin. Thus, by his ſenſes of *taſte* and *ſmell*, or by the *pleaſure* he receives from certain kinds of food, he is admoniſhed which agree with his conſtitution; and by an oppoſite ſenſe of *pain* he is informed which ſort diſagree, or are deſtructive of it; but is not by means of this inſtructed in the inward natures and conſtitutions of things.

67 Uſe of appetites and paſſions.

Some of thoſe ſenſes are armed with ſtrong degrees of *uneaſineſs* or *pain*, in order to urge him to ſeek after ſuch objects as are ſuited to them. And theſe reſpect his more immediate and preſſing *wants*; as the ſenſe of *hunger*, *thirſt*, *cold*, and the like; which, by their painful importunities, compel him to provide *food*, *drink*, *raiment*, *ſhelter*. Thoſe inſtincts by which we are thus prompted with ſome kind of commotion or violence to attract and purſue *good*, or to repel and avoid *ill*, we call *appetites* and *paſſions*. By our ſenſes then we are informed of what is *good* or *ill* to the *private ſyſtem*, or the *individual*; and by our *private appetites* and *paſſions* we are impelled to one, and reſtrained from the other.

68 Man's outward ſtate.

In conſequence of this machinery, and the great train of wants to which our nature ſubjects us, we are engaged in a continued ſeries of occupations, which often require much application of thought or great bodily labour, or both. The neceſſaries of life, food, clothes, ſhelter, and the like, muſt be provided; conveniencies muſt be acquired to render life ſtill more eaſy and comfortable. In order to obtain theſe, arts, induſtry, manufactures, and trade, are neceſſary. And to ſecure to us the peaceable enjoyment of their fruits, civil government, policy, and laws, muſt be contrived, and the various buſineſs of public life carried on: thus, while man is concerned and buſied in making proviſion, or obtaining ſecurity for himſelf, he is by degrees engaged in connections with a family, friends, neighbours, a community, or a commonwealth. Hence ariſe new wants, new intereſts, new cares, and new employments. The paſſions of one man interfere with thoſe of another. Intereſts are oppoſed. Competitions ariſe, contrary courſes are taken. Diſappointments happen, diſtinctions are made, and parties formed. This opens a vaſt ſcene of diſtraction and embarraſſment, and introduces a mighty train of good and ill, both public and private. Yet amidſt all this confuſion and hurry, plans of action muſt be laid, conſequences foreſeen or guarded againſt, inconveniences provided for; and frequently particular reſolutions, muſt be taken, and ſchemes executed, without reaſoning or delay.

69 Proviſions for it.

Now what proviſion has the Author of our nature made for this neceſſitous condition? how has he fitted the actor, man, for playing his part in this perplexed and buſy ſcene?

70 By public ſenſes and paſſions.

Our ſupreme Parent, watchful for the whole, has not left himſelf without a witneſs here neither, and hath made nothing imperfect, but all things are double one againſt the other. He has not left man to be informed, only by the cool notices of reaſon, of the *good* or *ill*, the *happineſs* or *miſery* of his fellow-creatures.—He has made him ſenſible of their good and happineſs, but eſpecially of their ill and miſery, by an immediate ſympathy, or quick *feeling* of *pleaſure* and of *pain*.

71 Pity.

The latter we call PITY or COMPASSION. For the former, though every one, who is not quite diveſted of humanity, feels it in ſome degree, we have not got a name, unleſs we call it CONGRATULATION or *joyful* SYMPATHY, or that *good humour* which ariſes on ſeeing others pleaſed or happy. Both theſe feelings have been called in general the PUBLIC or COMMON SENSE, κοινη μνημοσυνη, by which we feel for others, and are intereſted in their concerns as really, though perhaps leſs ſenſibly than in our own.

72 Congratulation.

73 Reſentment.

When we ſee our fellow-creatures unhappy through the fault or injury of others, we feel *reſentment* or *indignation* againſt the *unjuſt* cauſers of that miſery. If we are conſcious that it has happened through our fault or *injurious* conduct, we feel *ſhame*; and both theſe claſſes of *ſenſes* and *paſſions*, regarding *miſery* and *wrong*, are armed with ſuch ſharp ſenſations of *pain*, as not only prove a powerful guard and ſecurity to the *ſpecies*, or *public ſyſtem*, againſt thoſe ills it may, but ſerve alſo to leſſen or remove thoſe ills it does, ſuffer. Compaſſion draws us out of ourſelves to bear a part of the misfortunes of others, powerfully ſolicits us in their favour, melts us at the ſight of their diſtreſs, and makes us in ſome degree unhappy till they are relieved from it. It is peculiarly well adapted to the condition of human life, becauſe it is much more and oftener in our power to do miſchief than good, and to prevent or leſſen miſery than to communicate poſitive happineſs; and therefore it is an admirable reſtraint upon the more *ſelfiſh* paſſions, or thoſe violent impulſes that carry us to the hurt of others.

74
Public affections.

There are other particular *inſtincts* or *paſſions* which intereſt us in the concerns of others, even while we are moſt buſy about our own, and which are ſtrongly attractive of *good*, and repulſive of *ill* to them. Such are *natural affection*, *friendſhip*, *love*, *gratitude*, *deſire of fame*, *love of ſociety*, of *one's country*, and others that might be named. Now as the *private* appetites and paſſions were found to be armed with ſtrong ſenſations of deſire and uneaſineſs, to prompt man the more effectually to ſuſtain labours, and to encounter dangers in purſuit of thoſe goods that are neceſſary to the preſervation and welfare of the individual, and to avoid thoſe ills which tend to his deſtruction; in like manner it was neceſſary, that this *other* claſs of deſires and affections ſhould be prompted with as quick ſenſations of pain, not only to counteract the ſtrength of their antagoniſts, but to engage us in a virtuous activity for our relations, families, friends, neighbours, country. Indeed our *ſenſe* of *right* and *wrong* will admoniſh us that it is our *duty*, and *reaſon* and *experience* farther aſſure us that it is both our *intereſt* and beſt *ſecurity*, to promote the happineſs of others; but that *ſenſe*, that *reaſon*, and that *experience*, would frequently prove but weak and ineffectual prompters to ſuch a conduct, eſpecially in caſes of danger and hardſhip, and amidſt all the importunities of nature, and that conſtant hurry in which the *private* paſſions involve us, without the aid of thoſe particular *kind* affections which mark out to us particular ſpheres of duty, and with an agreeable violence engage and fix us down to them.

75
Contraſt or balance of paſſions.

It is evident, therefore, that thoſe two claſſes of affection, the *private* and *public*, are ſet one againſt the other, and deſigned to controul and limit each other's influence, and thereby to produce a juſt balance in the whole[*]. In general, the violent ſenſations of pain and uneaſineſs which accompany hunger, thirſt, and the other private appetites, or too great fatigue of mind as well as of body, prevent the individual from running to great exceſſes in the exerciſe of the higher functions of the mind, as too intenſe thought in the ſearch of truth, violent application to buſineſs of any kind, and different degrees of romantic heroiſm. On the other hand, the finer ſenſes of *perception*, and thoſe *generous deſires* and *affections* which are connected with them, the *love of action*, of *imitation*, of *truth*, *honour*, *public virtue*, and the like, are wiſely placed in the oppoſite ſcale, in order to prevent us from ſinking into the dregs of the *animal* life, and debaſing the dignity of man below the condition of brutes. So that, by the mutual re-action of thoſe oppoſite powers, the bad effects are prevented that would naturally reſult from their acting ſingly and apart, and the good effects are produced which each are ſeverally formed to produce.

76
Contraſt or balance of public and private paſſions.

The ſame wholeſome oppoſition appears likewiſe in the particular counter-workings of the *private* and *public* affections one againſt the other. Thus *compaſſion* is adapted to counterpoiſe the *love of eaſe*, of *pleaſure*, and of *life*, and to diſarm or to ſet bounds to *reſentment*; and *reſentment* of injury done to ourſelves, or to our friends who are dearer than ourſelves, prevents an effeminate *compaſſion* or *conſternation*, and gives us a noble contempt of labour, pain, and death. *Natural affection*, *friendſhip*, *love of one's country*, nay, *zeal* for any particular virtue, are frequently more than a match for the whole train of *ſelfiſh* paſſions. —On the other hand, without that intimate over-ruling paſſion of *ſelf-love*, and thoſe private deſires which are connected with it, the *ſocial* and *tender inſtincts* of the human heart would degenerate into the wildeſt dotage, the moſt torturing anxiety, and downright frenzy.

77
Contraſts among thoſe of the ſame claſſes.

But not only are the different orders or claſſes of affection checks one upon another, but paſſions of the ſame claſſes are mutual clogs. Thus, how many are with-held from the violent outrages of *reſentment* by *fear?* and how eaſily is *fear* controlled in its turn, while mighty wrongs awaken a mighty *reſentment!* The *private* paſſions often interfere, and therefore moderate the violence of each other; and a calm *ſelf-love* is placed at their head, to direct, influence, and controul their particular attractions and repulſions. The *public* affections likewiſe reſtrain one the other: and all of them are put under the controul of a calm diſpaſſionate *benevolence*, which ought in like manner to direct and limit their particular motions. Thus moſt part, if not all the paſſions, have a twofold aſpect, and ſerve a twofold end. In *one* view they may be conſidered as *powers*, impelling mankind to a certain courſe, with a *force* proportioned to the *apprehended moment* of the good they aim at. In *another* view they appear as *weights*, balancing the action of the *powers*, and controling the violence of their impulſes. By means of theſe *powers* and *weights* a natural *poiſe* is ſettled in the human breaſt by its all-wiſe Author, by which the creature is kept tolerably ſteady and regular in his courſe, amidſt that variety of ſtages through which he muſt paſs.

78
Particular perceptions or inſtincts of approbation.

But this is not all the proviſion which God has made for the hurry and perplexity of the ſcene in which man is deſtined to act. Amidſt thoſe infinite attractions and repulſions towards private and public good and ill, mankind either cannot often foreſee the *conſequences* or *tendencies* of all their actions towards one or other of theſe, eſpecially where thoſe tendencies are intricate and point different ways, or thoſe conſequences remote and complicated; or though, by careful and cool enquiry, and a due improvement of their rational powers, they might find them out, yet, diſtracted as they are with buſineſs, amuſed with trifles, diſſipated by pleaſure, and diſturbed by paſſion, they either have or can find no leiſure to attend to thoſe conſequences, or to examine how far this or that conduct is productive of private or public good on the whole. Therefore, were it left entirely to the ſlow and ſober deductions of reaſon to trace thoſe tendencies, and make out thoſe conſequences, it is evident, that in many particular inſtances the buſineſs of life muſt ſtand ſtill, and many important occaſions of action be loſt, or perhaps the groſſeſt blunders be committed. On this account, the Deity, beſides that general approbation which we beſtow on every degree of *kind* affection, has moreover implanted in man many particular *perceptions* or *determinations* to approve of certain *qualities* or *actions*, which, in effect, tend to the advantage of ſociety, and are connected with private good, though he does not always ſee that tendency, nor mind that connection. And theſe *perceptions* or *determinations* do without reaſoning point out, and, antecedent to views of intereſt, prompt to a conduct beneficial to the *public*, and uſeful to the *private* ſyſtem. Such is that *ſenſe of candour and veracity*, that *abhorrence of fraud and falſehood*, that *ſenſe of fidelity*, *juſtice*, *gratitude*, *greatneſs of mind*, *fortitude*, *clemency*, *decorum*; and that *diſapprobation of knavery*, *injuſtice*, *ingratitude*, *meanneſs of ſpirit*, *cowardice*, *cruelty*, and *indecorum*, which are natural to the human mind. The former of thoſe diſpoſitions, and the actions flowing from them, are approved, and thoſe of the latter kind diſapproved by us, even abſtracted from the view of their tendency or conduciveneſs to the happineſs or miſery of others, or of ourſelves. In one we diſcern a *beauty*, a *ſuperior excellency*, a congruity to the *dignity* of man; in the other a *deformity*, a *littleneſs*, a *debaſement*, of human nature.

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[*] Vide Hutcheſon's Conduct of the Paſſions, treat. I. §. 2.

79 Others of an inferior order.

There are other principles alſo connected with the good of ſociety, or the happineſs and perfection of the individual, though that connection is not immediately apparent, which we behold with real complacency and approbation, though perhaps inferior in degree, if not in kind, ſuch as *gravity*, *modeſty*, *ſimplicity of deportment*, *temperance*, *prudent œconomy*; and we feel ſome degree of contempt and diſlike where they are wanting, or where the oppoſite qualities prevail. Theſe and the like *perceptions* or *feelings* are either different *modifications* of the *moral ſenſe*, or *ſubordinate* to it, and plainly ſerve the ſame important purpoſe, being expeditious *monitors*, in the ſeveral emergencies of a various and diſtracted life, of what is *right*, what is *wrong*, what is to be *purſued*, and what *avoided*; and, by the pleaſant or painful conſciouſneſs which attends them, exerting their influence as powerful *prompters* to a ſuitable conduct.

80 Their general tendencies.

From a ſlight inſpection of the above-named principles, it is evident they all carry a friendly aſpect to *ſociety* and the *individual*, and have a more immediate or a more remote tendency to promote the *perfection* or *good* of both. This tendency cannot be always foreſeen, and would be often miſtaken or ſeldom attended to by a weak, buſy, ſhort-ſighted creature like man, both raſh and variable in his opinions, a dupe to his own paſſions or to the deſigns of others, liable to ſickneſs, to want, and to error. Principles, therefore, which are ſo nearly linked with *private ſecurity* and *public good*, by directing him, without operoſe reaſoning, where to find *one*, and how to promote the *other*; and, by prompting him to a conduct conducive to both, are admirably adapted to the exigencies of his preſent ſtate, and wiſely calculated to obtain the ends of univerſal benevolence.

81 Paſſions fitted to a ſtate of trial;

It were eaſy, by conſidering the ſubject in another light, to ſhow, in a curious detail of particulars, how wonderfully the inſide of man, or that aſtoniſhing train of *moral powers* and *affections* with which he is endued, is fitted to the ſeveral ſtages of that *progreſſive* and *probationary* ſtate through which he is deſtined to paſs. As our faculties are narrow and limited, and riſe from very ſmall and imperfect beginnings, they muſt be improved by exerciſe, by attention, and repeated trials. And this holds true, not only of our *intellectual*, but of our *moral* and *active* powers. The former are liable to errors in ſpeculation, the latter to blunders in practice, and both often terminate in miſfortunes and pains. And thoſe errors and blunders are generally owing to our paſſions, or to our too forward and warm *admiration* of theſe partial *goods* they naturally purſue, or to our fear of thoſe partial *ills* they naturally repel. Thoſe misfortunes, therefore, lead us back to conſider where our miſconduct lay, and whence our errors flowed; and conſequently are ſalutary pieces of trial, which tend to enlarge our views, to *correct* and *refine* our paſſions, and conſequently improve both our *intellectual* and *moral* powers. Our paſſions then are the rude materials of our virtue, which Heaven has given us to work up to refine and poliſh into an harmonious and divine piece of workmanſhip. They furniſh out the whole machinery, the calms and ſtorms, the lights and ſhades of human life. They ſhow mankind in every attitude and variety of character, and give *virtue* both its ſtruggles and triumphs. To conduct them well in every ſtate, is merit; to abuſe or miſapply them, is demerit.

82 To a progreſſive ſtate.

The different ſets of *ſenſes*, *powers*, and *paſſions*, which unfold themſelves in thoſe ſucceſſive ſtages, are both neceſſary and adapted to that *riſing* and *progreſſive* ſtate. Enlarging views and growing connections require new paſſions and new habits; and thus the mind, by theſe continually expanding and finding a progreſſive exerciſe, riſes to higher improvements, and puſhes forward to maturity and perfection.

83 Harmony of our ſtructure and ſtate.

In this beautiful œconomy and harmony of our ſtructure, both outward and inward, with that ſtate we may at once diſcern the great lines of our duty traced out in the faireſt and brighteſt characters, and contemplate with admiration a more auguſt and marvellous ſcene of divine wiſdom and goodneſs laid in the human breaſt, than we ſhall perhaps find in the whole compaſs of nature.

84 In what œconomy virtue conſiſts.

From this detail it appears, that man, by his original frame, is made for a *temperate*, *compaſſionate*, *benevolent*, *active*, and *progreſſive* ſtate. He is ſtrongly *attractive* of the *good*, and *repulſive* of the *ills* which befal others as well as himſelf. He feels the higheſt *approbation* and *moral complacence* in thoſe affections, and in thoſe actions, which immediately and directly reſpect the good of others, and the higheſt *diſapprobation* and *abhorrence* of the contrary. Beſides theſe, he has many particular *perceptions* or *inſtincts* of *approbation*, which, though perhaps not of the ſame kind with the others, yet are accompanied with correſpondent degrees of affection, proportioned to their reſpective tendencies to the *public good*. *Therefore*, by acting agreeably to theſe principles, *man* acts agreeable to his ſtructure, and fulfils the benevolent intentions of its author. But we call a thing *good* when it anſwers its *end*, and a creature *good*, when he acts in a *conformity* to his *conſtitution*. Conſequently, *man* muſt be denominated *good* or *virtuous* when he acts ſuitably to the *principles* and *deſtination* of his nature.

PART. II.

CHAP. I. *The principal diſtinctions of* DUTY *or* VIRTUE.

WE have now conſidered the *conſtitution* and *connections* of *man*, and on thoſe erected a general ſyſtem of *duty* or *moral obligation*, conſonant to *reaſon*, approved by his moſt ſacred and intimate *ſenſe*, ſuitable to his *mixed condition*, and confirmed by the *experience* of mankind. We have alſo traced the *final cauſes* of his *moral faculties* and *affections* to thoſe noble purpoſes they anſwer, with regard both to the *private* and the *public ſyſtem*.

85 General diviſion of duty. From this induction it is evident, that there is one order or claſs of duties which *man* owes to *himſelf*: another to *ſociety*: and a third to God.

86 Duty to one's ſelf. The duties he owes to *himſelf* are founded chiefly on the *defenſive* and *private* paſſions, which prompt him to purſue whatever tends to *private good* or *happineſs*, and to avoid or ward off whatever tends to *private ill* or *miſery*. Among the various goods which allure and ſolicit him, and the various ills which attack or threaten him, "to be intelligent and accurate in ſelecting *one*, and rejecting the *other*, or in preferring the moſt *excellent goods*, and avoiding the moſt *terrible ills*, when there is a competition among either, and to be diſcreet in uſing the beſt means to attain the *goods* and avoid the *ills*, is what we call *prudence*." This, in our *inward* frame, correſponds to *ſagacity*, or *quickneſs of ſenſe*, in our *outward*.—"To proportion our *defenſive paſſions* to our *dangers*, we call *fortitude*; which always implies "a juſt mixture of calm reſentment or animoſity, and well governed caution." And this *firmneſs of mind* anſwers to the *ſtrength* and *muſcling* of the *body*. And "duly to adjuſt our *private paſſions* to our wants, or to the reſpective moment of the good we effect or purſue, we call *temperance*;" which does therefore always imply, in this large ſenſe of the word, "a juſt balance or command of the paſſions"

87 Duties to ſociety. The *ſecond claſs* of *duties* ariſes from the *public* or *ſocial affections*, "the juſt harmony or proportion of which to the *dangers* and *wants* of others, and to the ſeveral *relations* we bear, commonly goes by the name of *juſtice*." This includes the whole of our duty to *ſociety*, to our *parents*, and the *general polity* of *nature*; particularly *gratitude*, *friendſhip*, *ſincerity*, *natural affection*, *benevolence*, and the other *ſocial virtues*: This, being the *nobleſt temper*, and *faireſt complexion* of the ſoul, correſponds to the *beauty* and *fine proportion* of the perſon. The virtues comprehended under the former claſs, eſpecially *prudence* and *fortitude*, may likewiſe be transferred to this; and according to the various circumſtances in which they are placed, and the more confined or more extenſive ſphere in which they operate, may be denominated *private*, *œconomical*, or *civil prudence*, *fortitude*, &c. Theſe direct our conduct with regard to the *wants* and *dangers* of thoſe leſſer or greater circles with which they are connected.

88 Duties to God. The third claſs of duties reſpects the DEITY, and ariſes from the *public affections*, and the ſeveral glorious *relations* which he ſuſtains to us as our *creator*, *benefactor*, *lawgiver*, *judge*, &c.

89 Method. We choſe to conſider this *ſet* of duties in the laſt place; becauſe, though *prior* in dignity and excellency, they ſeem to be *laſt* in order of time, as thinking it the moſt ſimple and eaſy method to follow the gradual progreſs of nature, as it takes its riſe from individuals, and ſpreads through the *ſocial* ſyſtem, and ſtill aſcends upwards, till at length it ſtretches to its Almighty Parent and Head, and ſo terminates in thoſe duties which are *higheſt* and *beſt*.

90 Piety. The duties reſulting from theſe *relations* are, *reverence*, *gratitude*, *love* *reſignation*, *dependence*, *obedience*, *worſhip*, *praiſe*: which, according to the model of our finite capacities, muſt maintain ſome ſort of proportion to the grandeur and perfection of the object whom we venerate, love, and obey. "This *proportion* or *harmony* is expreſſed by the general name of *piety* or *devotion*," which is always ſtronger or weaker according to the greater or leſs apprehended excellency of its object. This ſublime principle of virtue is the enlivening ſoul which animates the *moral ſyſtem*, and that cement which binds and ſuſtains the other duties which *man* owes to *himſelf* or to *ſociety*.

91 Conſcience This then is the general temper and conſtitution of virtue, and theſe are the principal lines or diviſions of duty. To thoſe good diſpoſitions which reſpect the ſeveral objects of our duty, and to all actions which flow from ſuch diſpoſitions, the mind gives its ſanction or teſtimony. And this ſanction or judgment concerning the moral quality, or the goodneſs of actions or diſpoſitions, moraliſts call *conſcience*. When it judges of an action that is to be performed, it is called an *antecedent conſcience*; and when it paſſes ſentence on an action which is performed, it is called a *ſubſequent conſcience*. The tendency of an action to produce happineſs, or its external conformity to a law, is termed its *material* goodneſs. But the good diſpoſitions from which an action proceeds, or its conformity to law in every reſpect, conſtitutes its *formal* goodneſs.

92 Its diviſions When the mind is ignorant or uncertain about the moment of an action or its tendency to private or public good; or when there are ſeveral circumſtances in the caſe, ſome of which, being doubtful render the mind dubious concerning the morality of the action; this is called a *doubtful* or *ſcrupulous conſcience*; if it miſtakes concerning theſe, it is called an *erroneous conſcience*. If the *error* or *ignorance* is *involuntary* or *invincible*, the action proceeding from that *error*, or from that *ignorance*, is reckoned *innocent*, or not imputable. If the error or ignorance is *ſupine* or *affected*, *i. e.* the effect of negligence, or of affectation and wilful inadvertence, the conduct flowing from ſuch error, or ſuch ignorance, is *criminal* and *imputable*.—Not to follow one's conſcience, though erroneous and ill-informed, is *criminal*, as it is the guide of life: and to counteract it, ſhows a depraved and incorrigible ſpirit. Yet to follow an erroneous conſcience is likewiſe

wiſe criminal, if that error which miſled the conſcience was the effect of inattention, or of any criminal paſſion*.

93 How conſcience is to be rectified.

If it be aſked, "How an erroneous conſcience ſhall be rectified, ſince it is ſuppoſed to be the only guide of life, and judge of morals?" we anſwer, in the very ſame way that we would rectify reaſon if at any time it ſhould judge wrong, as it often does, *viz.* by giving it proper and ſufficient materials for judging right, *i. e.* by inquiring into the whole ſtate of the caſe, the relations, connections, and ſeveral obligations of the actor, the conſequences and other circumſtances of the action, or the ſurpluſage of private or public good which reſults, or is likely to reſult, from the action or from the omiſſion of it. If thoſe circumſtances are fairly and fully ſtated, the conſcience will be juſt and impartial in its deciſion: for, by a neceſſary law of our nature, it approves and is well affected to the *moral form*; and if it ſeems to approve of *vice* or *immorality*, it is always under the notion or maſk of ſome *virtue*. So that, ſtrictly ſpeaking, it is not conſcience which errs; for its ſentence is always conformable to the view of the caſe which lies before it; and is *juſt*, upon the ſuppoſition that the caſe is truly ſuch as it is repreſented to it. All the fault is to be imputed to the agent, who neglects to be better informed, or who, through weakneſs or wickedneſs, haſtens to paſs ſentence from an imperfect evidence.

CHAP. II. *Of Man's duty to* HIMSELF. *Of the Nature of* GOOD, *and the Chief* GOOD.

94 Diviſions of good.

EVERY creature, by the conſtitution of his nature, is determined to love himſelf; to purſue whatever tends to his preſervation and happineſs, and to avoid whatever tends to his hurt and miſery. Being endued with ſenſe and perception, he muſt neceſſarily receive *pleaſure* from ſome objects, and *pain* from others. Thoſe objects which give pleaſure are called *good*; and thoſe which give pain, *evil*. To the former he feels that attraction or motion we call *deſire*, or *love*; to the latter, that impulſe we call *averſion*, or *hatred*.—To objects which ſuggeſt neither pleaſure nor pain, and are apprehended of no uſe to procure one or ward off the other, we feel neither *deſire* nor averſion; and ſuch objects are called *indifferent*. Thoſe objects which do not of themſelves produce pleaſure or pain, but are the *means* of procuring either, we call *uſeful* or *noxious*. Towards them we are affected in a ſubordinate manner, or with an *indirect* and *reflective* rather than a *direct* and *immediate* affection. All the original and particular affections of our nature lead us out to and ultimately reſt in the firſt kind of objects, *viz.* thoſe which give immediate pleaſure, and which we therefore call *good, directly ſo*. The calm affection of *ſelf-love* alone is converſant about ſuch objects as are only *conſequentially good*, or merely uſeful to ourſelves.

95 Moral good.

But, beſides thoſe ſorts of objects which we call *good*, merely and ſolely as they give pleaſure, or are means of procuring it, there is an higher and nobler ſpecies of good, towards which we feel that peculiar movement we call *approbation* or *moral complacency*; and which we *therefore* denominate *moral good*. Such are our affections, and the conſequent actions to them. The perception of this is, as has been already obſerved, quite diſtinct in kind from the perception of other ſpecies; and though it may be connected with *pleaſure* or *advantage* by the benevolent conſtitution of nature, yet it conſtitutes a *good* independent of that pleaſure and that advantage, and far ſuperior not in degree only but in dignity to both. The *other*, *viz.* the *natural good*, conſiſts in obtaining thoſe pleaſures which are adapted to the peculiar ſenſes and paſſions ſuſceptible of them, and is as various as are thoſe ſenſes and paſſions. This, *viz.* the *moral* good, lies in the right conduct of the ſeveral ſenſes and paſſions, or their juſt proportion and accommodation to their reſpective objects and relations; and this is of a more ſimple and invariable kind.

96 Human happpeſs.

By our ſeveral ſenſes we are capable of a great variety of pleaſing ſenſations. Theſe conſtitute diſtinct ends or objects ultimately purſuable for their own ſake. To theſe ends, or ultimate objects, correſpond peculiar appetites or affections, which prompt the mind to purſue them. When theſe ends are attained, there it reſts, and looks no farther. Whatever therefore is purſuable, not on its own account, but as ſubſervient or neceſſary to the attainment of ſomething elſe that is intrinſically valuable for its own ſake, be that value ever ſo great or ever ſo ſmall, we call a *mean*, and not an *end*. So that *ends* and *means* conſtitute the *materials* or the very *eſſence* of our *happineſs*. Conſequently happineſs, *i. e. human* happineſs, cannot be one ſimple uniform thing in creatures conſtituted, as we are, with ſuch various ſenſes of pleaſure, or ſuch different capacities of enjoyment. Now, the ſame principle, or law of our nature, which determines us to purſue any one end or ſpecies of good, prompts us to purſue every other end or ſpecies of good of which we are ſuſceptible, or to which our Maker has adapted an original propenſion. But, amidſt the great multiplicity of *ends* or *goods* which form the various ingredients of our happineſs, we perceive an evident *gradation* or *ſubordination* ſuited to that gradation of *ſenſes*, *powers*, and *paſſions*, which prevails in our mixed and various conſtitution, and to that aſcending ſeries of connections which open upon us in the different ſtages of our progreſſive ſtate.

97 Gradation of goods.

Thus the goods of the *body*, or of the *external ſenſes*, ſeem to hold the loweſt rank in this gradation or ſcale of goods. Theſe we have in common with the brutes; and though many men are brutiſh enough to purſue the goods of the body with a more than brutal fury, yet, when at any time they come in competition with goods of an higher order, the unanimous verdict of mankind, by giving the laſt the preference condemns the firſt to the meaneſt place. Goods conſiſting in exterior ſocial connections, as *fame*, *fortune*, *power*, *civil authority*, ſeem to ſucceed next, and are chiefly valuable as the means of procuring *natural* or *moral* good, but principally the latter. Goods of the *intellect* are ſtill ſuperior, as *taſte*, *knowledge*, *memory*, *judgment*, &c. The higheſt are moral goods of the mind, directly and ultimately regarding ourſelves, *command of the appetites* and *paſſions*, *prudence*, *fortitude*, *benevolence*, &c. Theſe are the great objects of our purſuit, and the principal ingredients of our happineſs.

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* Hutcheſ. Mor. Inſt. lib. 2. c. 3.

pineſs. Let us conſider each of them as they riſe one above the other in this natural ſeries or ſcale, and touch briefly on our obligations to purſue them.

98 Goods of the body. Thoſe of the body are *health*, *ſtrength*, *agility*, *hardineſs*, and *patience of change*, *neatneſs*, and *decency*.

99 Good health; Good health, and a regular eaſy flow of ſpirits, are in themſelves ſweet natural enjoyments, a great fund of pleaſure, and indeed the proper ſeaſoning which gives a flavour and poignancy to every other pleaſure. The want of health unfits us for moſt duties of life, and is eſpecially an enemy to the ſocial and humane affections, as it generally renders the unhappy ſufferer peeviſh and ſullen, diſguſted at the allotments of Providence, and conſequently apt to entertain ſuſpicious and gloomy ſentiments of its Author. It obſtructs the free exerciſe and full improvement of our reaſon, makes us a burden to our friends, and uſeleſs to ſociety. Whereas the uninterrupted enjoyment of good health is a conſtant ſource of good humour, and good humour is a great friend to openneſs and benignity of heart, enables us to encounter the various ills and diſappointments of life with more courage, or to ſuſtain them with more patience; and, in ſhort, conduces much, if we are otherwiſe duly qualified, to our acting our part in every exigency of life with more firmneſs, conſiſtency, and dignity. Therefore it imports us much to preſerve and improve an habit or enjoyment, without which every other external entertainment is taſteleſs, and moſt other advantages of little avail.— 100 How preſerved. And this is beſt done by a ſtrict temperance in diet and regimen, by regular exerciſe, and by keeping the mind ſerene and unruffled by violent paſſions, and unſubdued by intenſe and conſtant labours, which greatly impair and gradually deſtroy the ſtrongeſt conſtitutions.

101 Strength, agility, &c. *Strength*, *agility*, *hardineſs*, and *patience of change*, ſuppoſe health, and are unattainable without it; but they imply ſomething more, and are neceſſary to guard it, to give us the perfect uſe of life and limbs, and to ſecure us againſt many otherwiſe unavoidable ills.—The exerciſe of the neceſſary manual, and of moſt of the elegant arts of life, depends on ſtrength and agility of body: perſonal dangers, private and public dangers, the demands of our friends, our families, and country, require them; they are neceſſary in war, and ornamental in peace; fit for the employment of a country and a town life, and they exalt the entertainments and diverſions of both. 102 How attained. They are chiefly obtained by moderate and regular exerciſe.

103 Patience of change; Few are ſo much raiſed above want and dependence, or ſo exempted from buſineſs and care, as not to be often expoſed to inequalities and changes of diet, exerciſe, air, climate, and other irregularities. Now, what can be ſo effectual to ſecure one againſt the miſchiefs ariſing from ſuch unavoidable alterations, as hardineſs, and a certain verſatility of conſtitution which can bear extraordinary labours, and ſubmit to great changes, without any ſenſible uneaſineſs or bad conſequences. 104 How attained. This is beſt attained, not by an over-great delicacy and minute attention to forms, or by an invariable regularity in diet, hours, and way of living, but rather by a bold and diſcreet latitude of regimen. Beſides, deviations from eſtabliſhed rules and forms of living, if kept within the bounds of ſobriety and reaſon, are friendly to thought and original ſentiments, animate the dull ſcene of ordinary life and buſineſs, and agreeably ſtir the paſſions, which ſtagnate or breed ill-humour in the calms of life.

105 Neatneſs, decency, &c. *Neatneſs*, *cleanlineſs*, and *decency*, to which we may add *dignity* of *countenance*, and *demeanor*, ſeem to have ſomething refined and moral in them: at leaſt we generally eſteem them indications of an orderly, genteel, and well-governed mind, conſcious of an inward worth, or the repſect due to one's nature. Whereas *naſtineſs*, *ſlovenlineſs*, *aukwardneſs*, and *indecency*, are ſhrewd ſymptoms of ſomething mean, careleſs, and deficient, and betray a mind untaught, illiberal, unconſcious of what is due to one's ſelf or to others. How much cleanlineſs conduces to health, needs hardly to be mentioned; and how neceſſary it is to maintain one's character and rank in life, and to render us agreeable to others as well as to ourſelves, is as evident.—There are certain motions, airs, and geſtures, which become the human countenance and form, in which we perceive a *comelineſs*, *openneſs*, *ſimplicity*, *gracefulneſs*; and there are others, which to our ſenſe of decorum appear *uncomely*, *affected*, *diſingenuous*, and *aukward*, quite unſuitable to the native dignity of our face and form. The *firſt* are in themſelves the moſt eaſy, natural, and commodious, give one boldneſs and preſence of mind, a modeſt aſſurance, an addreſs both awful and alluring; they beſpeak candour and greatneſs of mind, raiſe the moſt agreeable prejudices in one's favour, render ſociety engaging, command reſpect, and often love, and give weight and authority both in converſation and buſineſs; in fine, they are the colouring of virtue, which ſhow it to the greateſt advantage in whomſoever it is; and not only imitate, but in ſome meaſure ſupply it where it is wanting. Whereas the laſt, *viz. rudeneſs*, *affectation*, *indecorum*, and the like, have all the contrary effects; they are burdenſome to one's ſelf, a diſhonour to our nature, and a nuiſance in ſociety. 106 How attained. The former qualities or goods are beſt attained by a liberal education, by preſerving a juſt ſenſe of the dignity of our nature, by keeping the beſt and politeſt company, but, above all, by acquiring thoſe virtuous and ennobling habits of mind which are decency in perfection, which will give an air of unaffected grandeur, and ſpread a luſtre truly engaging over the whole form and deportment.

107 Goods of exterior ſocial connections. We are next to conſider thoſe goods which conſiſt in exterior ſocial connections, as *fame*, *fortune*, *civil authority*, *power*.

108 Fame. The firſt has a two-fold aſpect, as a good pleaſant in itſelf, or gratifying to an original paſſion, and then as expedient or uſeful towards a farther end. Honour from the wiſe and good, on the account of a virtuous conduct, is regaling to a good man; for then his heart re-echoes to the grateful ſound. There are few quite indifferent even to the commendation of the vulgar. Though we cannot approve that conduct which proceeds entirely from this principle, and not from good affection or love of the conduct itſelf, yet, as it is often a guard and additional motive to virtue in creatures imperfect as we are, and often diſtracted by interfering paſſions, it might be dangerous to ſuppreſs it altogether, however wiſe it may be to reſtrain it within due bounds, and however laudable to uſe it only as a ſcaffolding to our virtue, which may be taken down when that glorious ſtructure is finiſhed, but hardly till

then. To purſue fame for itſelf, is innocent; to regard it only as an auxiliary to virtue, is noble; to ſeek it chiefly as an engine of public uſefulneſs, is ſtill more noble, and highly praiſe-worthy. For though the opinion and breath of men are tranſient and fading things, often obtained without merit, and loſt without cauſe; yet as our buſineſs is with men, and as our capacity of ſerving them is generally increaſed in proportion to their eſteem of us, therefore ſound and well-eſtabliſhed *moral* applauſe may and will be modeſtly, not oſtentatiouſly, ſought after by the *good;* not indeed as a ſolitary refined ſort of luxury, but as a public and proper inſtrument to ſerve and bleſs mankind. At the ſame time they will learn to deſpiſe that reputation which is founded on rank, fortune, and any other circumſtances or accompliſhments that are foreign to real merit, or to uſeful ſervices done to others, and think that praiſe of little avail which is purchaſed without deſert, and beſtowed without judgment.

109 Fortune, power, &c. *Fortune*, *power*, and *civil authority*, or whatever is called influence and weight among mankind, are *goods* of the *ſecond* diviſion, that is, valuable and purſuable only as they are *uſeful*, or as means to a farther end, *viz.* procuring or preſerving the immediate objects of enjoyment or happineſs to ourſelves or others. Therefore to love ſuch goods on their own account, and to purſue them as ends, not the means of enjoyment, muſt be highly prepoſterous and abſurd. There can be no meaſure, no limit, to ſuch purſuit; all muſt be whim, caprice, extravagance. Accordingly ſuch appetites, unlike all the *natural* ones, are increaſed by poſſeſſion, and whetted by enjoyment. They are always precarious, and never without fears, becauſe the objects lie without one's ſelf; they are ſeldom without ſorrow and vexation, becauſe no acceſſion of wealth or
110 How far purſuable. power can ſatisfy them. But if thoſe goods are conſidered only as the materials or means of private or public happineſs, then the ſame obligations which bind us to purſue the latter, bind us likewiſe to purſue the former. We may, and no doubt we ought, to ſeek ſuch a meaſure of wealth as is neceſſary to ſupply all our real wants, to raiſe us above ſervile dependence, and provide us with ſuch conveniences as are ſuited to our rank and condition in life. To be regardleſs of this meaſure of wealth, is to expoſe ourſelves to all the temptations of poverty and corruption; to forfeit our natural independency and freedom; to degrade, and conſequently to render the rank we hold, and the character we ſuſtain in ſociety, uſeleſs, if not contemptible. When theſe important ends are ſecured, we ought not to murmur or repine that we poſſeſs no more; yet we are not ſecluded by any obligation, moral or divine, from ſeeking more, in order to give us that happieſt and moſt god-like of all powers, the *power* of *doing good.* A ſupine indolence in this reſpect is both abſurd and criminal; *abſurd*, as it robs us of an inexhauſted fund of the moſt refined and durable enjoyments; and *criminal*, as it renders us ſo
111 Avarice. far uſeleſs to the ſociety to which we belong. "That purſuit of wealth which goes beyond the former end, viz. the obtaining the neceſſaries, or ſuch conveniencies of life, as, in the eſtimation of reaſon, not of vanity or paſſion, are ſuited to our rank and condition, and yet is not directed to the latter, viz. the doing good, is what we call *avarice.*" And "that purſuit of *power*, which, after ſecuring one's ſelf, *i. e.* having attained the proper independence and liberty of a rational ſocial creature, is not directed to the good of others, is what we call *ambition*, or the *luſt of power;*
112 Ambition. To what extent the ſtrict meaſures of virtue will allow us to purſue either wealth or power, and civil authority, is not perhaps poſſible preciſely to determine. That muſt be left to prudence, and the peculiar character, condition, and other circumſtances of each man. Only thus far a limit may be ſet, that the purſuit of either muſt encroach upon no other duty or obligation which we owe to ourſelves, to ſociety, or to its parent and head. The ſame reaſoning is to be applied to *power* as to *wealth.* It is only valuable as an inſtrument of our own ſecurity, and of the free enjoyment of thoſe original goods it may, and often does, adminiſter to us, and as an engine of more extenſive happineſs to our friends, our country, and mankind.

113 How fame and power are attained. Now the beſt, and indeed the only way to obtain a ſolid and laſting fame, is an uniform inflexible courſe of virtue, the employing one's ability and wealth in ſupplying the wants, and uſing one's power in promoting or ſecuring the happineſs, the rights and liberties of mankind, joined to an univerſal affability and politeneſs of manners. And ſurely one will not miſtake the matter much, who thinks the ſame courſe conducive to the acquiring greater acceſſions both of wealth and power; eſpecially if he adds to thoſe qualifications a vigorous induſtry, a conſtant attention to the characters and wants of men, to the conjunctures of times, and continually-varying genius of affairs; and a ſteady intrepid honeſty, that will neither yield to the allurements, nor be over-awed with the terrors, of that corrupt and corrupting ſcene in which we live. We have ſometimes heard indeed of other ways and means, as fraud, diſſimulation, ſervility, and proſtitution, and the like ignoble arts, by which the men of the world (as they are called, ſhrewd politicians, and men of addreſs!) amaſs wealth, and procure power; but as we want rather to form a man of virtue, an honeſt, contented, happy man, we leave to the men of the world their own ways, and permit them, unenvied and unimitated by us, to reap the fruit of their doings.

114 Goods of the intellect. The next ſpecies of objects in the ſcale of good, are the goods of the *intellect*, as *knowledge*, *memory*, *judgement*, *taſte*, *ſagacity*, *docility*, and whatever elſe we call intellectual virtues. Let us conſider them a little, and the means as well as obligations to improve them.

115 Their moment. As *man* is a *rational* creature capable of knowing the differences of things and actions;—as he not only ſees and feels what is preſent, but remembers what is paſt, and often foreſees what is future;—as he advances from ſmall beginnings by ſlow degrees, and with much labour and difficulty, to knowledge and experience;—as his opinions ſway his paſſions,—as his paſſions influence his conduct,—and as his conduct draws conſequences after it, which extend not only to the preſent but to the future time, and therefore is the principal ſource of his happineſs or miſery; it is evident, that he is formed for intellectual improvements, and that it muſt be of the utmoſt conſequence for him to improve and cultivate his intellectual powers, on which thoſe opinions, thoſe paſſions, and that conduct depend*.

But beſides the future conſequences and moment of

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* Philoſ. Sinic. Confuc. lib. I. § 3, 4. &c.

improving our intellectual powers, their immediate ex-
ercife on their proper objects yields the moſt rational
and refined pleaſures. Knowledge, and a right taſte in
116 The pleaſures they give. the arts of *imitation* and *deſign*, as *poetry*, *painting*, *ſculp-
ture*, *muſic*, *architecture*, afford not only an innocent,
but a moſt ſenſible and ſublime entertainment. By
theſe the underſtanding is inſtructed in ancient and
117 Knowledge and taſte; modern life, the hiſtory of men and things, the ener-
gies and effects of the paſſions, the conſequences of virtue and vice; by theſe the imagination is at once entertained and nouriſhed with the beauties of nature and art, lighted up and ſpread out with the novelty, grandeur, and harmony of the univerſe; and, in fine, the paſſions are agreeably rouſed, and ſuitably engaged, by the greateſt and moſt intereſting objects that can fill the human mind. He who has a taſte formed to theſe ingenious delights, and plenty of materials to gratify it, can never want the moſt agreeable exerciſe and entertainment, nor once have reaſon to make that faſhionable complaint of the tedioufneſs of time. Nor can he want a proper ſubject for the diſcipline and improvement of his heart. For, being daily converſant with *beauty*, *order*, and *deſign*, in inferior ſubjects, he bids fair for growing in due time an admirer of what is fair and well-proportioned in the conduct of life and the order of ſociety, which is only order and deſign exerted in their higheſt ſubject. He will learn to transfer the numbers of poetry to the harmony of the mind and of well-governed paſſions; and, from admiring the virtues of others in moral paintings, come to approve and imitate them himſelf. Therefore, to cultivate a *true* and *correct taſte* muſt be both our intereſt and our duty, when the circumſtances of our ſtation give leiſure and opportunity for it, and when the doing it is not inconſiſtent with our higher obligations or engagements to ſociety and mankind.

118 How attained. It is beſt attained by reading the beſt books, where *good ſenſe* has more the aſcendant than *learning*, and which pertain more to *practice* than to *ſpeculation*; by ſtudying the beſt models, *i. e.* thoſe which profeſs to imitate nature moſt, and approach the neareſt to it, and by converſing with men of the moſt refined taſte, and the greateſt experience in life.

119 Other intellectual goods; As to the other intellectual goods, what a fund of entertainment muſt it be to inveſtigate the truth and various relations of things, to trace the operations of nature to general laws, to explain by theſe its manifold phenomena, to underſtand that order by which the univerſe is upheld, and that œconomy by which it is governed! to be acquainted with the human mind, the connections, ſubordinations, and uſes of its powers, and to mark their energy in life! how agreeable to the ingenious inquirer, to obſerve the manifold relations and combinations of individual minds in ſociety, to diſcern the cauſes why they flouriſh or decay, and from thence to aſcend, through the vaſt ſcale of beings, to that general mind which preſides over all, and operates unſeen in every ſyſtem and in every age, through the whole compaſs and progreſſion of nature! Devoted to ſuch entertainments as theſe, the contemplative have abandoned every other pleaſure, retired from the body, ſo to ſpeak, and ſequeſtered themſelves from ſocial intercourſe; for theſe, the *buſy* have often preferred to the hurry and din of life the calm retreats of contemplation; for theſe, when once they came to taſte them, even the *gay* and *voluptuous* have thrown up the lawleſs purſuits of ſenſe and appetite, and acknowledged theſe mental enjoyments to be the moſt *refined*, and indeed the *only* luxury. Beſides, by a juſt and large knowledge of nature, we recogniſe the perfections of its author; and thus piety, and all thoſe pious affections which depend on juſt ſentiments of his character, are awakened and confirmed; and a thouſand ſuperſtitious fears, that ariſe from partial views of his nature and works, will of courſe be excluded. An extenſive proſpect of human life, and of the periods and revolutions of human things, will conduce much to the giving a certain greatneſs of mind, and a noble contempt to thoſe little competitions about power, honour, and wealth, which diſturb and divide the bulk of mankind; and promote a calm endurance of thoſe inconveniences and ills that are the common appendages of humanity. Add to all, that a juſt knowledge of human nature, and of thoſe hinges upon which the buſineſs and fortunes of men turn, will prevent our thinking either too highly or too meanly of our fellow-creatures, give no ſmall ſcope to the exerciſe of friendſhip, confidence, and good will, and at the ſame time brace the mind with a proper caution and diſtruſt (thoſe nerves of prudence), and give a greater maſtery in the conduct of private as well as public life. Therefore, by cultivating our intellectual abilities, we ſhall beſt promote and ſecure our intereſt, and be qualified for acting our part in ſociety with more honour to ourſelves, as well as advantage to mankind. Conſequently, to improve them to the utmoſt of our power is our duty; they are talents committed to us by the Almighty Head of ſociety, and we are accountable to him for the uſe of them.

120 How attained. The intellectual virtues are beſt improved by accurate and impartial obſervation, extenſive reading, and unconfined converſe with men of all characters, eſpecially with thoſe who, to private ſtudy, have joined the wideſt acquaintance with the world, and greateſt practice in affairs; but, above all, by being much in the world, and having large dealings with mankind. Such opportunities contribute much to diveſt one of prejudices and a ſervile attachment to crude ſyſtems, to open one's views, and to give that experience on which the moſt uſeful becauſe the moſt practical knowledge is built, and from which the ſureſt maxims for the conduct of life are deduced.

121 Moral goods. The higheſt goods which enter into the compoſition of human happineſs are *moral* goods of the mind, directly and ultimately regarding ourſelves; as *command of the appetites and paſſions*, *prudence and caution*, *magnanimity*, *fortitude*, *humility*, *love of virtue*, *love of God*, *reſignation*, and the like. Theſe ſublime goods are goods by way of eminence, goods recommended and enforced by the moſt intimate and awful ſenſe and conſciouſneſs of our nature; goods that conſtitute the quinteſſence, the very temper of happineſs, that form and complexion of ſoul which renders us approveable and lovely in the ſight of God; goods, in fine, which are the elements of all our future perfection and felicity.

122 Their moment. Moſt of the other goods we have conſidered depend partly on ourſelves, and partly on accidents which we can neither foreſee nor prevent, and reſult from cauſes which we cannot influence or alter. They are ſuch goods as we may poſſeſs to-day and loſe to-morrow,

and

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and which require a felicity of conſtitution, and talents to attain them in full vigour and perfection, and a felicity of conjunctures to ſecure the poſſeſſion of them. Therefore, did our happineſs depend altogether or chiefly on ſuch tranſitory and precarious poſſeſſions, it were itſelf moſt precarious, and the higheſt folly to be anxious about it.——But though creatures, conſtituted as we are, cannot be indifferent about ſuch goods and muſt ſuffer in ſome degree, and conſequently have our happineſs incomplete without them, yet they weigh but little in the ſcale when compared with moral good. By the benevolent conſtitution of our nature, theſe are placed within the ſphere of our activity, ſo that no man can be deſtitute of them unleſs he is firſt wanting to himſelf. Some of the wiſeſt and beſt of mankind have wanted moſt of the former goods, and all the external kind, and felt moſt of the oppoſite ills, ſuch at leaſt as ariſe from without; yet by poſſeſſing the latter, *viz.* the moral goods, have declared they were happy; and to the conviction of the moſt impartial obſervers have appeared happy. The worſt of men have been ſurrounded with every outward good and advantage of fortune, and have poſſeſſed great parts; yet, for want of moral rectitude, have been and have confeſſed themſelves, notoriouſly and exquiſitely miſerable. The exerciſe of virtue has ſupported its votaries, and made them exult in the midſt of tortures almoſt intolerable; nay, how often has ſome falſe form or ſhadow of it ſuſtained even the greateſt (D) villains and bigots under the ſame preſſures! But no external goods, no goods of fortune, have been able to alleviate the agonies or expel the fears of a guilty mind conſcious of the deſerved hatred and reproach of mankind, and the juſt diſpleaſure of Almighty God.

123 The mixed condition of human life requires particular virtues.

As the preſent condition of human life is wonderfully chequered with good and ill, and as no height of ſtation, no affluence of fortune, can abſolutely inſure the good, or ſecure againſt the ill, it is evident that a great part of the comfort and ſerenity of life muſt lie in having our minds duly affected with regard to both, *i. e.* rightly attempered to the loſs of one and the ſufferance of the other. For it is certain that outward calamities derive their chief malignity and preſſure from the inward diſpoſitions with which we receive them. By managing theſe right, we may greatly abate that malignity and preſſure, and conſequently diminiſh the number, and weaken the moment, of the ills of life, if we ſhould not have it in our power to obtain a large ſhare of its goods. There are particularly three virtues which go to the forming this right temper towards ill, and which are of ſingular efficacy, if not totally to remove, yet wonderfully to alleviate the calamities of life. Theſe are *fortitude* or *patience*, *humility* and *reſignation*.

124 Fortitude.

Fortitude is that calm and ſteady habit of mind which either moderates our fears, and enables us bravely to encounter the proſpect of ill, or renders the mind ſerene and invincible under its immediate preſſure. It lies equally diſtant from raſhneſs and cowardice; and though it does not hinder us from feeling, yet prevents our complaining or ſhrinking under the ſtroke. It always includes a generous contempt of, or at leaſt a noble ſuperiority to, thoſe precarious goods of which we can inſure neither the poſſeſſion nor continuance. The man therefore who poſſeſſes this virtue in this ample ſenſe of it, ſtands upon an eminence, and ſees human things below him; the tempeſt indeed may reach him, but he ſtands ſecure and collected againſt it upon the baſis of conſcious virtue, which the ſevereſt ſtorms can ſeldom ſhake, and never overthrow.

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125 Humility.

Humility is another virtue of high rank and dignity, though often miſtaken by proud mortals for meanneſs and puſillanimity. It is oppoſed to *pride*, which commonly includes in it a falſe or over-rated eſtimation of our own merit, an aſcription of it to ourſelves, as its only and original cauſe, an undue compariſon of ourſelves with others, and in conſequence of that ſuppoſed ſuperiority, an arrogant preference of ourſelves, and a ſupercilious contempt of them. *Humility*, on the other hand, ſeems to denote that modeſt and ingenuous temper of mind, which ariſes from a juſt and equal eſtimate of our own advantages compared with thoſe of others, and from a ſenſe of our deriving all originally from the Author of our being. Its ordinary attendants are mildneſs, a gentle forbearance, and an eaſy unaſſuming humanity with regard to the imperfections and faults of others; virtues rare indeed, but of the faireſt complexion, the proper offspring of ſo lovely a parent, the beſt ornament of ſuch imperfect creatures as we are, precious in the ſight of God, and which ſweetly allure the hearts of men.

126 Reſignation.

Reſignation is the mild and heroic temper of mind which ariſes from a ſenſe of an infinitely wiſe and good providence, and enables one to acquieſce with a cordial affection in its juſt appointments. This virtue has ſomething very particular in its nature, and ſublime in its efficacy. For it teaches us to bear ill, not only with patience, and as being unavoidable, but it transforms, as it were, ill into good, by leading us to conſider it, and every event that has the leaſt appearance of ill, as a divine diſpenſation, a wiſe and benevolent temperament of things, ſubſervient to univerſal good, and of courſe including that of every individual, eſpecially of ſuch as calmly ſtoop to it. In this light, the adminiſtration itſelf, nay every act of it, becomes an object of affection, the evil diſappears, or is converted into a balm which both heals and nouriſheth the mind. For though the firſt unexpected acceſs of ill may ſurpriſe the ſoul into grief, yet that grief, when the mind calmly reviews its object, changes into contentment, and is by degrees exalted into veneration and a divine compoſure. Our private will is loſt in that of the Almighty, and our ſecurity againſt every real ill reſts on the ſame bottom as the throne of him who lives and reigns for ever.

127 Chief good, objective and formal.

Before we finiſh this ſection, it may be fit to obſerve, that as the Deity is the ſupreme and inexhauſted ſource of good, on whom the happineſs of the whole creation

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(D) As Ravillac, who aſſaſſinated Henry IV. of France; and Balthaſar Gererd, who murdered William I. prince of Orange.

creation depends; as he is the higheſt object in nature, and the only object who is fully proportioned to the intellectual and moral powers of the mind, in whom they ultimately reſt, and find their moſt perfect exerciſe and completion; he is therefore termed the *Chief good of man*, objectively conſidered. And *virtue*, or the proportioned and vigorous exerciſe of the ſeveral powers and affections on their reſpective objects, as above deſcribed, is, in the ſchools, termed the *chief good*, formally conſidered, or its formal idea, being the inward temper and native conſtitution of human happineſs.

From the detail we have gone through, the following corollaries may be deduced.

128 Corollaries *Firſt*, It is evident, that the happineſs of ſuch a *progreſſive* creature as man can never be at a ſtand, or continue a fixed invariable thing. His finite nature, let it riſe ever ſo high, admits ſtill higher degrees of improvement and perfection. And his progreſſion in improvement or virtue always makes way for a progreſſion in happineſs. So that no poſſible point can be aſſigned in any period of his exiſtence in which he is perfectly happy, that is, ſo happy as to exclude higher degrees of happineſs. All his perfection is only comparative. 2. It appears that many things muſt conſpire to complete the happineſs of ſo *various* a creature as man, ſubject to ſo many wants, and ſuſceptible of ſuch different pleaſures. 3. As his capacities of pleaſure cannot be all gratified at the ſame time, and muſt often interfere with each other in ſuch a precarious and fleeting ſtate as human life, or be frequently diſappointed, perfect happineſs, *i. e.* the undiſturbed enjoyment of the ſeveral pleaſures of which we are capable, is unattainable in our preſent ſtate. 4. That ſtate is moſt to be ſought after, in which the feweſt competitions and diſappointments can happen, which leaſt of all impairs any ſenſe of pleaſure, and opens an inexhauſted ſource of the moſt refined and laſting enjoyments. 5. That ſtate which is attended with all thoſe advantages, is a ſtate or courſe of virtue. 6. *Therefore*, a ſtate of *virtue*, in which the moral goods of the mind are attained, is the *happieſt ſtate*.

CHAP. III. *Duties of* SOCIETY.

SECT. I. *Filial and Fraternal Duty.*

As we have followed the order of nature in tracing the hiſtory of man, and thoſe duties which he owes to himſelf, it ſeems reaſonable to take the ſame method with thoſe he owes to ſociety, which conſtitute the *ſecond* claſs of his *obligations*.

129 Connection of parents. His parents are among the earlieſt objects of his attention; he becomes ſooneſt acquainted with them, repoſes a peculiar confidence in them, and ſeems to regard them with a fond affection, the early prognoſtics of his future *piety* and *gratitude*. Thus does nature dictate the firſt lines of filial duty, even before a juſt ſenſe of the connection is formed. But when the child is grown up, and has attained to ſuch a degree of underſtanding, as to comprehend the *moral tie*, and be ſenſible of the obligations he is under to his parents: when he looks back on their tender and diſintereſted affection, their inceſſant cares and labours in nurſing, educating, and providing for him, during that ſtate in which he had neither prudence nor ſtrength to care and provide for himſelf, he muſt be conſcious that he owes to them theſe peculiar duties.

130 Duties to parents. 1. To reverence and honour them, as the inſtruments of nature in introducing him to life, and to that ſtate of comfort and happineſs which he enjoys; and therefore to eſteem and imitate their good qualities, to alleviate and bear with, and ſpread, as much as poſſible a decent veil over their faults and weakneſſes.

2. To be highly grateful to them, for thoſe favours which it can hardly ever be in his power fully to repay: to ſhow this gratitude by a ſtrict attention to their wants, and a ſolicitous care to ſupply them; by a ſubmiſſive deference to their authority and advice, eſpecially by paying great regard to it in the choice of a wife, and of an occupation; by yielding to, rather than peeviſhly contending with, their humours, as remembering how oft they have been perſecuted by his; and, in fine, by ſoothing their cares, lightening their ſorrows, ſupporting the infirmities of age, and making the remainder of their life as comfortable and joyful as poſſible.

131 Duties to brethren and ſiſters. As his brethren and ſiſters are the next with whom the creature forms a *ſocial* and *moral* connection, to them he owes a *fraternal* regard; and with them ought he to enter into a ſtrict league of friendſhip, mutual ſympathy, advice, aſſiſtance, and a generous intercourſe of kind offices, remembering their relation to common parents, and that brotherhood of nature which unites them into a cloſer community of intereſt and affection.

SECT. II. *Concerning Marriage.*

132 Connection with the other ſex. WHEN man arrives to a certain age, he becomes ſenſible of a peculiar ſympathy and tenderneſs towards the other ſex: the charms of beauty engage his attention, and call forth new and ſofter diſpoſitions than he has yet felt. The many amiable qualities exhibited by a fair outſide, or by the mild allurement of female manners, or which the prejudiced ſpectator without much reaſoning ſuppoſes thoſe to include, with ſeveral other circumſtances both natural and accidental, point his view and affection to a particular object, and of courſe contract that general rambling regard, which was loſt and uſeleſs among the undiſtinguiſhed crowd, into a peculiar and permament attachment to one woman, which ordinarily terminates in the moſt important, venerable, and delightful connections in life.

133 The grounds of this connection. The ſtate of the brute creation is very different from that of human creatures. The former are clothed and generally armed by their ſtructure, eaſily find what is neceſſary to their ſubſiſtence, and ſoon attain their vigour and maturity; ſo that they need the care and aid of their parents but for a ſhort while; and therefore we ſee that nature has aſſigned to them vagrant and tranſient amours. The connection being purely *natural*, and merely for propagating and rearing their offſpring, no ſooner is that end anſwered, than the connection diſſolves of courſe. But the human race are of a more tender and defenceleſs conſtitution; their infancy and non-age continue longer; they advance ſlowly to ſtrength of body and maturity of reaſon; they need conſtant attention, and a long ſeries of cares and labours, to train them up to decency, virtue, and the various arts of life. Nature has, there-

Duties of Society. therefore, provided them with the moſt affectionate and anxious tutors, to aid their weakneſs, to ſupply their wants, and to accompliſh them in thoſe neceſſary arts, even their own parents, on whom ſhe has devolved this mighty charge, rendered agreeable by the moſt alluring and powerful of all ties, parental affection. But unleſs both concur in this grateful taſk, and continue their joint labours, till they have reared up and planted out their young colony, it muſt become a prey to every rude invader, and the purpoſe of nature in the original union of the human pair be defeated. Therefore our ſtructure as well as condition is an evident indication, that the human ſexes are deſtined for a more intimate, for a moral and laſting union. It appears likewiſe, that the principal end of marriage is not to propagate and nurſe up an offſpring, but to educate and form minds for the great duties and extenſive deſtinations of life. Society muſt be ſupplied from this original nurſery with uſeful members, and its faireſt ornaments and ſupports.

134
Moral ends of marriage. The mind is apt to be diſſipated in its views and acts of friendſhip and humanity; unleſs the *former* be directed to a particular object, and the *latter* employed in a particular province. When men once indulge in this diſſipation, there is no ſtopping their career; they grow inſenſible to moral attractions; and, by obſtructing or impairing the decent and regular exerciſe of the tender and generous feelings of the human heart, they in time become unqualified for, or averſe to, the forming a moral union of ſouls, which is the cement of ſociety, and the ſource of the pureſt domeſtic joys. Whereas a rational, undepraved *love*, and its fair companion, *marriage*, collect a man's views, guide his heart to its proper object, and, by confining his affection to that object, do really enlarge its influence and uſe. Beſides, it is but too evident from the conduct of mankind, that the common ties of humanity are too feeble to engage and intereſt the paſſions of the generality in the affairs of ſociety. The connections of neighbourhood, acquaintance and general intercourſe, are too wide a field of action for many, and thoſe of a *public* or *community* are ſo far more; and in which they *either care not, or know not how* to exert themſelves. Therefore nature, ever wiſe and benevolent, by implanting that ſtrong ſympathy which reigns between the individuals of each ſex, and by urging them to form a particular moral connection, the ſpring of many domeſtic endearments has meaſured out to each pair a particular *ſphere of action*, proportioned to their views, and adapted to their reſpective capacities. Beſides, by intereſting them deeply in the concerns of their own little circle, ſhe has connected them more cloſely with ſociety, which is compoſed of particular families, and bound them down to their good behaviour in that particular community to which they belong. This *moral connection* is *marriage*, and this *ſphere of action* is a *family*.

135
Duties of marriage. Of the *conjugal* alliance the following are the *natural laws*. Firſt, mutual fidelity to the marriage-bed. Diſloyalty defeats the very end of marriage; diſſolves the natural cement of the relation; weakens the moral tie, the chief ſtrength of which lies in the reciprocation of affection; and, by making the offſpring uncertain, diminiſhes the care and attachment neceſſary to their education.

2. A conſpiration of counſels and endeavours to promote the common intereſt of the family, and to educate their common offſpring. In order to obſerve theſe laws, it is neceſſary to cultivate, both before and during the married ſtate, the ſtricteſt decency and chaſtity of manners, and a juſt ſenſe of what becomes their reſpective characters.

3. The union muſt be inviolable, and for life. The nature of friendſhip, and particularly of this ſpecies of it, the education of their offſpring, and the order of ſociety and of ſucceſſions, which would otherwiſe be extremely perplexed, do all ſeem to require it. To preſerve this union, and render the matrimonial ſtate more harmonious and comfortable, a mutual eſteem and tenderneſs, a mutual deference and forbearance, a communication of advice, and aſſiſtance and authority, are abſolutely neceſſary. If either party keep within their proper departments, there need be no diſputes about power or ſuperiority, and there will be none. They have no *oppoſite*, no *ſeparate* intereſts, and therefore there can be no juſt ground for oppoſition of conduct.

136
Polygamy. From this detail, and the preſent ſtate of things, in which there is pretty near a parity of numbers of both ſexes, it is evident that *polygamy* is an *unnatural* ſtate; and though it ſhould be granted to be more fruitful of children, which however, it is not found to be, yet it is by no means ſo fit for rearing minds, which ſeems to be as much, if not more, the intention of natue than the propagation of bodies.

Sect. III. *Of Parental Duty.*

137
Connection of parents and children. The connection of parents with their children is a natural conſequence of the matrimonial connection; and the duties which they owe them reſult as naturally from that connection. The feeble ſtate of children, ſubject to ſo many wants and dangers, requires their inceſſant care and attention; their ignorant and uncultivated minds demand their continual inſtruction and culture. Had human creatures come into the world with the full ſtrength of *men*, and the weakneſs of reaſon and vehemence of paſſions which prevail in *children*, they would have been too ſtrong or too ſtubborn to have ſubmitted to the government and inſtruction of their parents. But as they were deſigned for a progreſſion in knowledge and virtue, it was proper that the growth of their bodies ſhould keep pace with that of their minds, leſt the purpoſes of that progreſſion ſhould have been defeated. Among other admirable purpoſes which this gradual expanſion of their outward as well as inward ſtructure ſerves, this is one, that it affords ample ſcope to the exerciſe of many tender and generous affections, which fill up the domeſtic life with a beautiful variety of duties and enjoyments; and are of courſe a noble diſcipline for the heart, and an hardy kind of education for the more honourable and important duties of *public* life.

138
The authority founded on that connection. The abovementioned weak and ignorant ſtate of children ſeems plainly to inveſt their parents with ſuch authority and power as is neceſſary to their ſupport, protection, and education; but that authority and power can be conſtrued to extend no farther than is neceſſary to anſwer thoſe ends, and to laſt no longer than that weakneſs and ignorance continue; wherefore, the foundation or reaſon of the authority and power

power ceaſing, they ceaſe of courſe. Whatever power or authority then it may be neceſſary or lawful for parents to exerciſe during the non-age of their children, to aſſume or uſurp the ſame when they have attained the maturity or full exerciſe of their ſtrength and reaſon would be tyrannical and unjuſt. From hence it is evident, that parents have no right to puniſh the perſons of their children more ſeverely than the nature of their wardſhip requires, much leſs to invade their lives, to encroach upon their liberty, or transfer them as their property to any maſter whatſoever.

139
Duties of parents.

The firſt claſs of duties which parents owe their children reſpect their natural life; and theſe comprehend protection, nurture, proviſion, introducing them into the world in a manner ſuitable to their rank and fortune, and the like.

140
Education.

The ſecond order of duties regards the *intellectual* and *moral* life of their children, or their education in ſuch arts and accompliſhments as are neceſſary to qualify them for performing the duties they owe to themſelves and to others. As this was found to be the principal deſign of the matrimonial alliance, ſo the fulfilling that deſign is the moſt important and dignified of all the parental duties. In order therefore to fit the child for acting his part wiſely, and worthily as a *man*, as a *citizen*, and a *creature of God*, both parents ought to combine their joint wiſdom, authority, and power, and each party to employ thoſe talents which are the peculiar excellency and ornament of their reſpective ſex. The father ought to *lay out* and *ſuperintend* their education, the mother to execute and manage the detail of which ſhe is capable. The *former* ſhould direct the manly exertion of the intellectual and moral powers of his child. His imagination, and the manner of thoſe exertions, are the peculiar province of the *latter*. The *former* ſhould adviſe, protect, command, and, by his experience, maſculine vigour, and that ſuperior authority which is commonly aſcribed to his ſex, brace and ſtrengthen his pupil for *active* life, for gravity, integrity, and firmneſs in ſuffering. The buſineſs of the *latter* is to bend and ſoften her *male* pupil, by the charms of her converſation, and the ſoftneſs and decency of her manners, for *ſocial* life, for politeneſs of taſte, and the elegant decorums and enjoyments of humanity; and to improve and refine the tenderneſs and modeſty of her *female* pupil, and form her to all thoſe mild domeſtic virtues which are the peculiar characteriſtics and ornaments of her ſex. To conduct the opening minds of their ſweet charge through the ſeveral periods of their progreſs, to aſſiſt them in each period, in throwing out the latent ſeeds of reaſon and ingenuity, and in gaining freſh acceſſions of light and virtue; and at length, with all theſe advantages, to produce the young adventurers upon the great theatre of human life, to play their ſeveral parts in the ſight of their friends, of ſociety, and mankind!

SECT. IV. *Herile and Servile Duty.*

141
The ground of the connection.

In the natural courſe of human affairs, it muſt neceſſarily happen that ſome of mankind will live in plenty and opulence, and others be reduced to a ſtate of indigence and poverty. The former need the labours of the latter and the latter proviſion and ſupport of the former. This mutual neceſſity is the foundation of that connection, whether we call it *moral* or *civil*, which ſubſiſts between maſters and ſervants.

142
The conditions of ſervice.

He who feeds another has a right to ſome equivalent, the labour of him whom he maintains, and the fruits of it. And he who labours for another has a right to expect that he ſhould ſupport him. But as the labours of a man of ordinary ſtrength are certainly of greater value than mere food and clothing; becauſe they would actually produce more, even the maintenance of a family, were the labourer to employ them in his own behalf; therefore he has an undoubted right to rate and diſpoſe of his ſervice for certain wages above mere maintenance; and if he has incautiouſly diſpoſed of it for the latter only, yet the contract being of the *onerous* kind, he may equitably claim a ſupply of that deficiency. If the ſervice be ſpecified, the ſervant is bound to that only; if not, then he is to be conſtrued as bound only to ſuch ſervices as are conſiſtent with the laws of juſtice and humanity. By the voluntary ſervitude to which he ſubjects himſelf he forfeits no rights but ſuch as are neceſſarily included in that ſervitude, and is obnoxious to no puniſhment but ſuch as a voluntary failure in the ſervice may be ſuppoſed reaſonably to require. *The offſpring of ſuch ſervants* have a right to that liberty which neither they nor their parents have forfeited.

143
The caſe of great offenders.

As to thoſe who, becauſe of ſome heinous offence, or for ſome notorious damage, for which they cannot otherwiſe compenſate, are condemned to perpetual ſervice, they do not, on that account, forfeit all the rights of men; but thoſe, the loſs of which is neceſſary to ſecure ſociety againſt the like offences for the future, or to repair the damage they have done.

144
The caſe of captives.

With regard to captives taken in war, it is barbarous and inhuman to make perpetual ſlaves of them, unleſs ſome peculiar and aggravated circumſtances of guilt have attended their hoſtility. The bulk of the ſubjects of any government engaged in war may be fairly eſteemed innocent enemies; and therefore they have a right to that clemency which is conſiſtent with the common ſafety of mankind, and the particular ſecurity of that ſociety againſt which they are engaged. Though ordinary captives have a grant of their lives, yet to pay their liberty as an equivalent is much too high a price. There are other ways of acknowledging or returning the favour, than by ſurrendring what is far dearer than life itſelf *. To thoſe who, under pretext of the neceſſities of commerce, derive the unnatural trade of bargaining for human fleſh, and conſigning their innocent but unfortunate fellow creatures to eternal ſervitude and miſery, we may addreſs the words of a fine writer; "Let avarice defend it as it will, there is an honeſt reluctance in humanity againſt buying and ſelling, and regarding thoſe of our own ſpecies as our wealth and poſſeſſions."

SECT. V. *Social Duties of the private Kind.*

Hitherto we have conſidered only the *domeſtic œconomical* duties, becauſe theſe are firſt in the progreſs of nature. But as man paſſes beyond the little circle of a family, he forms connections with relations, friends, neighbours, and others; from whence reſults

a new

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* Hutcheſ. Mor. Inſt. Phil. lib. 3. c. 3.

Duties of Society. a new train of duties of the more private ſocial kind, as "friendſhip, chaſtity, courteſy, good neighbourhood, charity, forgiveneſs, hoſpitality."

145 Man's aptitude for ſociety. Man is admirably formed for particular ſocial attachments and duties. There is a peculiar and ſtrong propenſity in his nature to be affected with the ſentiments and diſpoſitions of others. Men, like certain muſical inſtruments, are ſet to each other, ſo that the vibrations or notes excited in one raiſe correſpondent notes and vibrations in the others. The impulſes of *pleaſure* or *pain*, *joy* or *ſorrow*, made on one mind, are by an inſtantaneous ſympathy of nature communicated in ſome degree to all; eſpecially when hearts are (as an humane writer expreſſes it) in *uniſon* of kindneſs; the joy that vibrates in one communicates to the other alſo. We may add, that though joy thus imparted ſwells the harmony, yet grief vibrated to the heart of a friend, and rebounding from thence in ſympathetic notes, melts as it were, and almoſt dies away. All the paſſions, but eſpecially thoſe of the ſocial kind, are contagious; and when the paſſions of one man mingle with thoſe of another, they increaſe and multiply prodigiouſly. There is a moſt moving eloquence in the human countenance, air, voice, and geſture, wonderfully expreſſive of the moſt latent feelings and paſſions of the ſoul, which darts them like a ſubtle flame into the hearts of others, and raiſes correſpondent feelings there: friendſhip, love, good-humour, joy, ſpread through every feature, and particularly ſhoot from the eyes their ſofter and fiercer fires with an irreſiſtible energy. And in like manner the oppoſite paſſions of hatred, enmity, ill-humour, melancholy, diffuſe a ſullen and ſaddening air over the face, and, flaſhing from eye to eye, kindle a train of ſimilar paſſions. By theſe, and other admirable pieces of machinery, men are formed for ſociety and the delightful interchange of friendly ſentiments and duties, to increaſe the happineſs of others by participation, and their own by rebound; and to diminiſh, by dividing, the common ſtock of their miſery.

146 Duties ariſing from private relation. The firſt emanations of the *ſocial* principle beyond the bounds of a family lead us to form a nearer conjunction of friendſhip or good-will with thoſe who are any wiſe connected with us by *blood* or *domeſtic alliance*. To them our affection does commonly exert itſelf in a greater or leſs degree, according to the nearneſs or diſtance of the relation. And this proportion is admirably ſuited to the extent of our powers and the indigence of our ſtate; for it is only within thoſe leſſer circles of conſanguinity or alliance that the generality of mankind are able to diſplay their abilities or benevolence, and conſequently to uphold their connection with ſociety and ſubſerviency, to a public intereſt. Therefore it is our duty to regard theſe cloſer connections as the next department to that of a family, in which nature has marked out for us a ſphere of activity and uſefulneſs; and to cultivate the kind affections which are the cement of thoſe endearing alliances.

147 Ingredients of friendſhip. Frequently the view of diſtinguiſhing moral qualities in ſome of our acquaintance may give birth to that more noble connection we call FRIENDSHIP, which is far ſuperior to the alliances of conſanguinity. For theſe are of a ſuperficial, and often of a tranſitory nature, of which, as they hold more of *inſtinct* than of *reaſon*, we cannot give ſuch a rational account. But *friendſhip* derives all its ſtrength and beauty, and the only exiſtence which is durable, from the qualities of the heart, or from virtuous and lovely diſpoſitions. Or, ſhould theſe be wanting, they or ſome ſhadow of them muſt be ſuppoſed preſent.— Therefore *friendſhip* may be deſcribed to be, "The union of two ſouls by means of *virtue*, the common object and cement of their mutual affection." Without virtue, or the ſuppoſition of it, friendſhip is only a *mercenary* league, an alliance of intereſt, which muſt diſſolve of courſe when that intereſt decays or ſubſiſts no longer. It is not ſo much any particular paſſion, as a compoſition of ſome of the nobleſt feelings and paſſions of the mind. *Good ſenſe*, a *juſt taſte* and *love of virtue*, a *thorough candour* and *benignity of heart*, or what we uſually call a *good temper*, and a generous ſympathy of ſentiments and affections, are the neceſſary ingredients of this virtuous connection. When it is grafted on eſteem ſtrengthened by habit, and mellowed by time, it yields infinite pleaſure, ever new and ever growing; is a noble ſupport amidſt the various trials and viciſſitudes of life, and an high ſeaſoning to moſt of our other enjoyments.— To form and cultivate virtuous friendſhip, muſt be very improving to the temper, as its principal *object* is *virtue*, ſet off with all the allurement of countenance, air, and manners, ſhining forth in the native graces of manly honeſt ſentiments and affections, and rendered *viſible* as it were to the friendly ſpectator in a conduct unaffectedly great and good; and as its principal exerciſes are the very energies of virtue, or its effect and emanations. So that wherever this amiable attachment prevails, it will exalt our admiration and attachment to virtue, and, unleſs impeded in its courſe by unnatural prejudices, run out into a friendſhip to the human race. For as no one can merit, and none ought to uſurp, the ſacred name of friend, who hates mankind; ſo whoever truly loves *them*, poſſeſſes the moſt eſſential quality of a true friend.

148 Its duties. The duties of friendſhip are a mutual eſteem of each other, unbribed by intereſt, and independent of it, a generous confidence as far diſtant from ſuſpicion as from reſerve, an inviolable harmony of ſentiments and diſpoſitions of deſigns and intereſts, a fidelity unſhaken by the changes of fortune, a conſtancy unalterable by diſtance of time or place, a reſignation of one's perſonal intereſt to thoſe of one's friend, and a reciprocal, unenvious, unreſerved exchange of kind offices.— But, amidſt all the exertions of this moral connection, humane and generous as it is, we muſt remember that it operates within a narrow ſphere, and its immediate operations reſpect only the individual; and therefore its particular impulſes muſt ſtill be ſubordinate to a more public intereſt, or be always directed and controlled by the more extenſive connections of our nature.

149 Love and chaſtity. When our friendſhip terminates on any of the other ſex, in whom beauty or agreeableneſs of perſon and external gracefulneſs of manners conſpire to expreſs and heighten the moral charm of a tender honeſt heart, and ſweet, ingenious, modeſt temper, lighted up by good ſenſe; it generally grows into a more ſoft and endearing attachment. When this attachment is im-

proved

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† See sect. iv. of this chap.

proved by a growing acquaintance with the worth of its object, is conducted by discretion, and issues at length, as it ought to do, in the nuptial connection formerly mentioned †, it becomes the source of many amiable duties, of a communication of passions and interests, of the most refined decencies, and of a thousand nameless deep-felt joys of reciprocal tenderness and love, flowing from every look, word, and action. Here friendſhip acts with double energy, and the *natural* conſpires with the *moral* charms to ſtrengthen and ſecure the love of virtue. As the delicate nature of female honour and decorum, and the inexpreſſible grace of a chaſte and modeſt behaviour, are the ſureſt and indeed the only means of kindling at firſt, and ever after of keeping alive, this tender and elegant flame, and of accompliſhing the excellent ends deſigned by it; to attempt by fraud to violate one, or, under pretence of paſſion, to ſully and corrupt the other, and, by ſo doing, to expoſe the too often credulous and unguarded object, with a wanton cruelty, to the hatred of her own ſex and the ſcorn of ours, and to the loweſt infamy of both, is a conduct not only baſe and criminal, but inconſiſtent with that truly rational and refined enjoyment, the ſpirit and quinteſſence of which is derived from the baſhful and ſacred charms of virtue kept untainted, and therefore ever alluring to the lover's heart.

150 Courteſy, good neighbourhood, &c.

Courteſy, *good-neighbourhood*, *affability*, and the like duties, which are founded on our private ſocial connections, are no leſs neceſſary and obligatory to creatures united in ſociety, and ſupporting and ſupported by each other in a chain of mutual want and dependence. They do not conſiſt in a ſmooth addreſs, an artificial or obſequious air, fawning adulation, or a polite ſervility of manners; but in a juſt and modeſt ſenſe of our own dignity and that of others, and of the reverence due to mankind, eſpecially to thoſe who hold the higher links of the ſocial chain; in a diſcreet and manly accommodation of ourſelves to the foibles and humours of others; in a ſtrict obſervance of the rules of decorum and civility; but, above all, in a frank obliging carriage, and generous interchange of good deeds rather than words. Such a conduct is of great uſe and advantage, as it is an excellent ſecurity againſt injury, and the beſt claim and recommendation to the eſteem, civility, and univerſal reſpect of mankind. This inferior order of virtues unites the particular members of ſociety more cloſely, and forms the leſſer pillars of the civil fabric; which, in many inſtances, ſupply the unavoidable defects of laws, and maintain the harmony and decorum of ſocial intercourſe, where the more important and eſſential lines of virtue are wanting.

151 Charity, Forgiveneſs.

Charity and *forgiveneſs* are truly amiable and uſeful duties of the ſocial kind. There is a twofold diſtinction of rights commonly taken notice of by moral writers, viz. *perfect* and *imperfect*. To fulfil the former, is neceſſary to the being and ſupport of ſociety; to fulfil the latter, is a duty equally ſacred and obligatory, and tends to the improvement and proſperity of ſociety; but as the violation of them is not equally prejudicial to the public good, the fulfilling them is not ſubjected to the cognizance of law, but left to the candour, humanity, and gratitude of individuals. And by this means an ample ſcope is given to exerciſe all the generoſity, and diſplay the [illegible] nature, of virtue. Thus the wants and misfortunes of others call for our charitable aſſiſtance and ſeaſonable ſupplies. And the good man, unconſtrained by law, and uncontrouled by human authority, will cheerfully acknowledge and generouſly ſatisfy this mournful and moving claim; a claim ſupported by the ſanction of heaven, of whoſe bounties he is honoured to be the grateful truſtee. If his own *perfect* rights are invaded by the injuſtice of others, he will not therefore reject their *imperfect* right to pity and forgiveneſs, unleſs his grant of theſe ſhould be inconſiſtent with the more extenſive rights of ſociety, or the public good In that caſe he will have recourſe to public juſtice and the laws, and even then he will proſecute the injury with no unneceſſary ſeverity, but rather with mildneſs, and humanity. When the injury is merely perſonal, and of ſuch a nature as to admit of alleviations, and the forgiveneſs of which would be attended with no worſe conſequences, eſpecially of a public kind, the good man will generouſly forgive his offending brother. And it is his duty to do ſo, and not to take private revenge, or retaliate evil for evil. For though reſentment of injury is a natural paſſion, and implanted, as was obſerved * above, for wiſe and good ends; yet, conſidering the manifold partialities which moſt men have for themſelves, was every one to act as judge in his own cauſe, and to execute the ſentence dictated by his own reſentment, it is but too evident that mankind would paſs all bounds in their fury, and the laſt ſufferer be provoked in his turn to make full repriſals. So that evil, thus encountering with evil, would produce one continned ſeries of violence and miſery, and render ſociety intolerable, if not impracticable. Therefore, where the ſecurity of the individual, or the good of the public, does not require a proportionable retaliation, it is agreeable to the general law of benevolence, and to the particular end of the paſſion (which is to prevent injury and the miſery occaſioned by it), to forgive perſonal injuries, or not to return evil for evil. This duty is one of the noble refinements which *Chriſtianity* has made upon the general maxims and practice of mankind, and enforced, with a peculiar ſtrength and beauty, by ſanctions no leſs alluring than awful. And indeed the practice of it is generally its own reward; by expelling from the mind the moſt dreadful intruders upon its repoſe, thoſe rancorous paſſions which are begot and nurſed by reſentment, and by diſarming and even ſubduing every enemy one has, except ſuch as have nothing left of men but the outward form.

152 Hoſpitality.

The moſt enlarged and humane connection of the private kind ſeems to be the hoſpitable alliance, from which flow the amiable and diſintereſted duties we owe to ſtrangers. If the exerciſe of paſſions of the moſt private and inſtinctive kind is beheld with moral approbation and delight, how lovely and venerable muſt thoſe appear which reſult from a calm philanthropy, are founded in the common rights and connections of ſociety, and embrace men, not of a particular ſect, party, or nation, but all in general without diſtinction, and without any of the little partialities of ſelf-love.

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* See Part I. chap ii. and iv.

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SECT. VI. *Social duties of the* COMMERCIAL *kind.*

153 Commercial duties.

THE next order of connections are those which ariſe from the wants and weakneſſes of mankind, and from the various circumſtances in which their different ſituations place them. Theſe we may call *commercial* connections, and the duties which reſult from them *commercial* duties, as *juſtice, fair-dealing, ſincerity, fidelity to compacts*, and the like.

154 Their foundation.

Though nature is perfect in all her works, yet ſhe has obſerved a manifeſt and eminent diſtinction among them. To all ſuch as lye beyond the reach of human ſkill and power, and are properly of her own department, ſhe has given the finiſhing hand. Theſe man may deſign after and imitate, but he can never rival them, nor add to their beauty or perfection. Such are the forms and ſtructure of vegetables, animals, and many of their productions, as the honey-comb the ſpider's web, and the like. There are others of her works which ſhe has of deſign left unfiniſhed, as it were, in order to exerciſe the ingenuity and power of man. She has preſented to him a rich profuſion of materials of every kind for his conveniency and uſe; but they are rude and unpoliſhed, or not to be come at without art and labour, Theſe therefore he muſt apply, in order to adapt them to his uſe, and to enjoy them in perfection. Thus nature has given him an infinite variety of herbs, grain, foſſils, minerals, wood, water, earth, air, and a thouſand other crude materials, to ſupply his numerous wants. But he muſt ſow, plant, dig, refine, poliſh, build, and, in ſhort, manufacture the various produce of nature, in order to obtain even the neceſſaries, and much more the conveniences and elegancies of life. Theſe then are the price of his labour and induſtry, and, without that, nature will ſell him nothing. But as the wants of mankind are many, and the ſingle ſtrength of individuals ſmall, they could hardly find the neceſſaries, and much leſs the conveniencies of life, without uniting their ingenuity and ſtrength in acquiring theſe, and without a mutual intercourſe of good offices. Some men are better formed for ſome kinds of ingenuity and labour, and others for other kinds; and different ſoils and climates are enriched with different productions; ſo that men, by exchanging the produce of their reſpective labours, and ſupplying the wants of one country with the ſuperfluities of another, do in effect diminiſh the labours of each, and increaſe the abundance of all. This is the foundation of all commerce, or exchange of commodities and goods, one with another; in order to facilitate which, men have contrived different ſpecies of coin, or money, as a common ſtandard by which to eſtimate the comparative values of their reſpective goods. But to render commerce ſure and effectual, *juſtice, fair dealing, ſincerity*, and *fidelity to compacts*, are abſolutely neceſſary.

155 Juſtice;

Juſtice or *fair dealing*, or, in other words, a diſpoſition to treat others as we would be treated by them, is a virtue of the firſt importance, and inſeparable from the virtuous character. It is the cement of ſociety, or that pervading ſpirit which connects its members, inſpires its various relations, and maintains the order and ſubordination of each part to the whole. Without it, ſociety would become a den of thieves and banditti, hating and hated, devouring and devoured, by one another.

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And here it may be proper to take a view of Mr Hume's ſuppoſed caſe of the ſenſible knave and the worthleſs miſer (nº 16.), and conſider what would be the duty of the former according to the theory of thoſe moraliſts who hold the *will of God* to be the *criterion or rule*, and *everlaſting happineſs* the *motive* of human virtue.

156 Univerſality a duty on the principles of thoſe who hold the will of God to be the criterion.

It has been already obſerved, and the truth of the obſervation cannot be controverted, that, by ſecretly purloining from the coffers of a miſer part of that gold which there lies uſeleſs, a man might in particular circumſtances, promote the good of ſociety, without doing any injury to a ſingle individual; and it was hence inferred, that, in ſuch circumſtances, it would be no duty to abſtain from theft were *local utility* ariſing from *particular conſequences* the real criterion or ſtandard of juſtice. Very different, however, is the concluſion which muſt be drawn by thoſe who conſider the natural tendency of actions, if univerſally performed, as the criterion of their merit or demerit in the ſight of God. Such philoſophers attend, not to the particular conſequences of a ſingle action in any given caſe, but to the general conſequences of the principle from which it flows, if that principle were univerſally adopted. You cannot (ſay they) permit one action and forbid another, without ſhowing a difference between them. The ſame ſort of actions, therefore, muſt be generally permitted or generally forbidden. But were every man allowed to aſcertain for himſelf the circumſtances in which the good of ſociety would be promoted, by ſecretly abſtracting the ſuperfluous wealth of a worthleſs miſer, it is plain that no property could be ſecure: that all incitements to induſtry would be at once removed; and that, whatever might be the *immediate* conſequences of any *particular theft*, the *general* and *neceſſary* conſequences of the *principle* by which it was authorized muſt ſoon prove fatal. Were one man to purloin part of the riches of a real miſer, and to conſider his conduct as vindicated by his intention to employ thoſe riches in acts of generoſity, another might by the ſame ſort of caſuiſtry think himſelf authoriſed to appropriate to himſelf part of his wealth; and thus theft would ſpread through all orders of men, till ſociety were diſſolved in ſeparate, hoſtile, and ſavage families, mutually dreading and ſhunning each other. The general conſequences, therefore, of encroaching upon private property tend evidently and violently to univerſal miſery.

On the other hand, indeed, the particular and immediate conſequences of that principle which conſiders every man's property as ſacred, may in ſome caſes, ſuch as that ſuppoſed, be in a ſmall degree injurious to a few families in the neighbourhood of the miſer and the knave. But that injury can never be of long duration; and it is infinitely more than counterbalanced by the general good conſequences of the principle from which it accidentally reſults; for theſe conſequences extend to all nations and to all ages. Without a ſacred regard to property, there could neither be arts nor induſtry nor confidence among men, and happineſs would be for ever baniſhed from this world. But the communication of happineſs being the end which God had in view when he created the world, and all men ſtanding in the ſame relation to him, it is impoſſible to ſuppoſe that he does not approve, and will not ultimately reward, thoſe voluntary actions of which the natural tendency is to increaſe the ſum of human happineſs; or that he does not diſapprove, and will not ultimately puniſh, thoſe which naturally tend to aggravate human miſery. The concluſion is, that a ſtrict adherence to the principle of juſtice is univerſally, and in all poſſible circumſtances, a duty from which we cannot deviate without offending our Creator, and ultimately bringing miſery upon ourſelves.

175 Sincerity.

Sincerity or *veracity*, in our words and actions, is another virtue or duty of great importance to ſociety, being one of the great bands of mutual intercourſe, and the foundation of mutual truſt. Without it, ſociety would be the dominion of miſtruſt, jealouſy, and fraud, and converſation a traffic of lies and diſſimulation. It includes in it a conformity of our words with our ſentiments, a correſpondence between our actions and diſpoſitions, a ſtrict regard to truth, and an irreconcileable abhorence of falſehood. It does not indeed require, that we expoſe our ſentiments indiſcreetly, or tell all the truth in every caſe; but certainly it does not, and cannot admit the leaſt violation of truth or contradiction to our ſentiments. For if theſe bounds are once paſſed, no poſſible limit can be aſſigned where the violation ſhall ſtop, and no pretence of private or public good can poſſibly counterbalance the ill conſequences of ſuch a violation.

158 Fidelity to promiſes, compacts, &c.

Fidelity to promiſes, *compacts*, and *engagements* is likewiſe a duty of ſuch importance to the ſecurity of commerce and interchange of benevolence among mankind, that ſociety would ſoon grow intolerable without the ſtrict obſervance of it. Hobbes and others who follow the ſame track, have taken a wonderful deal of pains to puzzle this ſubject, and to make all the virtues of this ſort merely *artificial*, and not at all *obligatory*, antecedent to human conventions. No doubt compacts ſuppoſe people who make them: and promiſes perſons to whom they are made; and therefore both ſuppoſe ſome ſociety, more or leſs, between thoſe who enter into theſe mutual engagements. But is not a compact or promiſe binding, till men have agreed that they ſhall be binding? or are they only binding, becauſe it is our intereſt to be bound by them or to fulfil them? Do not we highly approve the man who fulfils them, even though they ſhould prove to be againſt his intereſt? and do not we condemn him as a knave who violates them on that account? A promiſe is a voluntary declaration by words, or by an action equally ſignificant; of our reſolution to do ſomething in behalf of another, or for his ſervice. When it is made, the perſon who makes it is by all ſuppoſed under an obligation to perform it. And he to whom it is made may demand the performance as his right. That perception of *obligaton* is a ſimple idea, and is on the ſame footing as our other moral perceptions, which may be deſcribed by inſtances, but cannot be defined. Whether we have a perception of ſuch obligation quite diſtinct from the intereſt, either public or private, that may accompany the fulfilment of it muſt be referred to the conſcience of every individual. And whether the mere ſenſe of that obligation apart from its concomitant, is not a ſufficient inducement or motive to keep one's promiſe, without having recourſe to any ſelfiſh principle of our nature, muſt be likewiſe appealed to the conſcience of every honeſt man.

159 Shown to be duties independent of the authority of the moral ſenſe.

It may, however, be not improper to remark, that in this, as in all other inſtances, our chief good is combined with our duty. "Men act from expectation. Expectation is in moſt caſes determined by the aſſurances and engagements which we receive from others. If no dependence could be placed upon theſe aſſurances, it would be impoſſible to know what judgement to form of many future events, or how to regulate our conduct with reſpect to them, Confidence, therefore, in promiſes, is eſſential to the intercourſe of human life, becauſe without it the greateſt part of our conduct would proceed upon chance. But there could be no confidence in promiſes, if men were not obliged to perform them." Thoſe, therefore, who allow not to the perceptions of the moral ſenſe all that authority which we attribute to them, muſt ſtill admit the obligation to perform promiſes; becauſe ſuch performance may be ſhown to be agreeable to the will of God, in the very ſame manner in which upon their principles we have ſhown the uniform practice of juſtice to be ſo.

160 What the duties require.

Fair dealing and *fidelity* to *compacts* require that we take no advantage of the ignorance, paſſion, or incapacity of others, from whatever cauſe that incapacity ariſes;—that we be explicit and candid in making bargains, juſt and faithful in fulfiling our part of them. And if the other party violates his engagements, redreſs is to be ſought from the laws, or from thoſe who are intruſted with the execution of them. In fine, the *commercial* virtues and duties require that we not only do not invade, but maintain the rights of others;—that we be fair and impartial in transferring, bartering, or exchanging property, whether in goods or ſervice: and be inviolably faithful to our word and our engagements, where the matter of them is not criminal, and where they are not extorted by force. See Promise.

Sect. VII. *Social Duties of the* Political *Kind.*

16 Politic connections.

We are now arrived at the laſt and higheſt order of duties reſpecting ſociety, which reſult from the exerciſe of the moſt generous and heroic affections, and are founded on our moſt enlarged connections.

The *ſocial* principle in man is of ſuch an expanſive nature, that it cannot be confined within the circuit of a family, of friends, or a neighbourhood; it ſpreads into wider ſyſtems, and draws men into larger confederacies, communities, and commonwealths. It is in theſe only that the higher powers of our nature attain the higheſt improvement and perfection of which they are capable. Theſe principles hardly find objects in the ſolitary ſtate of nature. *There* the principle of action riſes no higher at fartheſt than *natural affection* towards one's offspring. There perſonal or family wants entirely engroſs the creature's attention and labour, and allow no leiſure, or, if they did, no exerciſe for views and affections of a more enlarged kind. In *ſolitude* all are employed in the ſame way, in providing for the *animal* life. And even after their utmoſt labour and care, ſingle and unaided by the induſtry of others, they find but a ſorry ſupply of their wants, and a feeble precarious ſecurity againſt dangers from wild beaſts; from inclement ſkies and ſeaſons;

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ſons; from the miſtakes or petulant paſſions of their fellow-creatures; from their preference of themſelves to their neighbours; and from all the little exorbitances of ſelf-love. But in *ſociety*, the mutual aids which men give and receive ſhorten the labours of each, and the combined ſtrength and reaſon of individuals give ſecurity and protection to the whole body. There is both a variety and ſubordination of genius among mankind. Some are formed to lead and direct others, to contrive plans of happineſs for individuals, and of government for communities, to take in a public intereſt, invent laws and arts, and ſuperintend their execution, and, in ſhort, to refine and civilize human life. Others, who have not ſuch good heads, may have as honeſt hearts, a truly public ſpirit, love of liberty, hatred of corruption and tyranny, a generous ſubmiſſion to laws, order, and public inſtitutions, and an extenſive philanthropy. And others, who have none of thoſe capacities either of heart or head, may be well formed for manual exerciſes and bodily labour. The former of theſe principles has no ſcope in ſolitude, where a man's thoughts and concerns do all either centre in himſelf or extend no farther than a family; into which little circle all the duty and virtue of the ſolitary mortal is crowded. But ſociety finds proper objects and exerciſes for every genius, and the nobleſt objects and exerciſes for the nobleſt geniuſes, and for the higheſt principles of the human conſtitution; particularly for that warmeſt and moſt divine paſſion which God hath kindled in our boſoms, the inclination of doing good, and reverencing our nature; which may find here both employment and the moſt exquiſite ſatisfaction. In ſociety, a man has not only more leiſure, but better opportunities, of applying his talents with much greater perfection and ſucceſs, eſpecially as he is furniſhed with the joint advice and aſſiſtance of his fellow creatures, who are now more cloſely united one with the other, and ſuſtain a common relation to the ſame moral ſyſtem or community. This then is an object proportioned to his moſt enlarged ſocial affections; and in ſerving it he finds ſcope for the exerciſe and refinement of his higheſt intellectual and moral powers. *Therefore ſociety, or a ſtate of civil government*, reſts on theſe two principal pillars, "That in it we find ſecurity againſt thoſe evils which are unavoidable in ſolitude —and obtain thoſe goods, ſome of which cannot be obtained at all, and others not ſo well, in that ſtate where men depend ſolely on their individual ſagacity and induſtry."

From this ſhort detail it appears, that *man* is a *ſocial* creature, and formed for a *ſocial* ſtate; and that *ſociety*, being adapted to the higher principles and deſtinations of his nature, muſt of neceſſity be his *natural* ſtate.

162 Political duties,

The duties ſuited to that ſtate, and reſulting from thoſe principles and deſtination, or, in other words, from our ſocial paſſions and ſocial connections, or relation to a public ſyſtem, are, *love of our country, reſignation, and obedience to the laws, public ſpirit, love of liberty, ſacrifice of life and all to the public, and the like.*

163 Love of one's country.

Love of our country, is one of the nobleſt paſſions that can warm and animate the human breaſt. It includes all the limited and particular affections to our parents, friends, neighbours, fellow-citizens, countrymen. It ought to direct and limit their more confined and partial actions within their proper and natural bounds, and never let them encroach on thoſe ſacred and firſt regards we owe to the great public to which we belong. Were we ſolitary creatures, detached from the reſt of mankind, and without any capacity of comprehending a *public intereſt*, or without affections leading us to deſire and purſue it, it would not be our duty to mind it, nor criminal to neglect it. But as we are PARTS of the *public ſyſtem*, and are not only capable of taking in large views of its intereſts, but by the ſtrongeſt affections connected with it, and prompted to take a ſhare of its concerns, we are under the moſt ſacred ties to proſecute its ſecurity and welfare with the utmoſt ardour, eſpecially in times of public trial. This *love of our country* does not import an attachment to any particular ſoil, climate or ſpot of earth, where perhaps we firſt drew our breath, though thoſe *natural* ideas are often aſſociated with the *moral* ones, and, like external ſigns or ſymbols, help to aſcertain and bind them; but it imports an affection to that *moral ſyſtem*, or *community*, which is governed by the ſame laws and magiſtrates, and whoſe ſeveral parts are variouſly connected one with the other, and all united upon the bottom of a common intereſt. Perhaps indeed every member of the community cannot comprehend ſo large an object, eſpecially if it extends through large provinces, and over vaſt tracts of land; and ſtill leſs can he form ſuch an idea, if there is no *public, i. e.* if all are ſubject to the caprice and unlimited will of one man; but the preference the generality ſhow to their native country, the concern and longing after it which they expreſs when they have been long abſent from it; the labours they undertake and ſufferings they endure to ſave or ſerve it, and the peculiar attachment they have to their countrymen, evidently demonſtrate that the paſſion is *natural*, and never fails to exert itſelf when it is fairly diſengaged from foreign clogs; and is directed to its proper object. Wherever it prevails in its genuine vigour and extent, it ſwallows up all ſordid and ſelfiſh regards; it conquers the love of *eaſe, power, pleaſure*, and *wealth*; nay, when the amiable partialities of *friendſhip, gratitude, private affection*, or *regards to a family*, come in competition with it, it will teach us bravely to ſacrifice all, in order to maintain the rights, and *promote* or *defend* the honour and happineſs of our country.

164 Reſignation and obedience to the laws, &c.

Reſignation and *obedience to the laws* and *orders* of the ſociety to which we belong, are *political* duties neceſſary to its very being in ſecurity, without which it muſt ſoon degenerate into a ſtate of licentiouſneſs and anarchy. The welfare, nay, the nature of civil ſociety, requires that there ſhould be a ſubordination of orders, or diverſity of ranks and conditions in it;—that certain men, or orders of men, be appointed to ſuperintend and manage ſuch affairs as concern the public ſafety and happineſs;—that all have their particular provinces aſſigned them;—that ſuch a ſubordination be ſettled among them as none of them may interfere with another; and finally, that certain *rules* or *common meaſures of action* be agreed on, by which each is to diſcharge his reſpective duty to govern or be governed, and all may concur in ſecuring the order

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der, and promote the liberty, of the whole political body. The laws of the society are the dictates of the community; and those who are in *higher orders* are the general officers or magistrates appointed by the whole to explain them, and ſuperintend or aſſiſt in their execution. In conſequence of this ſettlement of things, it is the duty of every individual to obey the laws enacted; to ſubmit to the executors of them with all due deference and homage, according to their reſpective ranks and dignity, as to the keepers of the public peace, and the guardians of public liberty; to remain in his own rank, and perform the functions of his own ſtation, with diligence, fidelity, and incorruption. The ſuperiority of the *higher* orders, or the authority with which the nature has inveſted them, entitle them, eſpecially if they employ their authority well, to the obedience and ſubmiſſion of the *lower*, and to a proportionable honour and reſpect from all. The ſubordination of the lower ranks claims protection, defence, and ſecurity from the higher. And the laws, being ſuperior to all, require the obedience and ſubmiſſion of all, being the laſt reſort, beyond which there is no deciſion or appeal.

165 Foundation of public ſpirit, love of liberty, &c.

Public ſpirit, *heroic zeal*, *love of liberty*, and the other *political* duties, do, above all others, recommend thoſe who practiſe them to the admiration and homage of mankind; becauſe, as they are the offſpring of the nobleſt minds, ſo *are they* the parents of the greateſt bleſſing to ſociety. Yet, exalted as they are, it is only in equal and free governments where they can be exerciſed and have their due effect. For there only does a true *public ſpirit* prevail, and there only is the *public good* made the ſtandard of the civil conſtitution. As the end of ſociety is the *common intereſt* and *welfare* of the people aſſociated, this end muſt of neceſſity be the *ſupreme law* or *common ſtandard*, by which the particular rules of action of the ſeveral members of the ſociety towards each other are to be regulated. But a *common intereſt* can be no other than that which is the reſult of the *common reaſon* or *common feelings* of all. Private men, or a particular order of men, have intereſts and feelings peculiar to themſelves, and of which they may be good judges; but theſe may be ſeparate from, and often contrary to the intereſts and feelings of the reſt of the ſociety; and therefore they can have no right to make, and much leſs to impoſe, laws on their fellow-citizens, inconſiſtent with, and oppoſite to, thoſe intereſts and thoſe feelings. Therefore, a *ſociety*, a *government*, or *real public*, truly worthy the name, and not a confederacy of banditti, a clan of lawleſs ſavages, or a band of ſlaves under the whip of a maſter, muſt be ſuch a one as conſiſts of freemen, chuſing or conſenting to laws themſelves; or, ſince it often happens that they cannot aſſemble and act in a *collective body*, delegating a ſufficient number of *repreſentatives*, i. e. ſuch a number as ſhall moſt fully comprehend, and moſt equally repreſent, their *common feelings* and *common intereſt*, to digeſt and vote laws for the conduct and controul of the whole body, the moſt agreeable to thoſe common feelings and common intereſts.

166 Political duties of every citizen.

A ſociety thus conſtituted by *common reaſon*, and formed on the plan of a *common intereſt*, becomes immediately an object of public attention, public veneration, public obedience, a public and inviolable attachment, which ought neither to be ſeduced by bribes, nor awed by terrors; an object, in fine, of all thoſe extenſive and important duties which ariſe from ſo glorious a confederacy. To watch over ſuch a ſyſtem; to contribute all he can to promote its good by his reaſon, his ingenuity, his ſtrength, and every other ability, whether natural or acquired; to reſiſt, and, to the utmoſt of his power, defeat every incroachment upon it, whether carried on by a ſecret corruption or open violence; and to ſacrifice his eaſe, his wealth, his power, nay life itſelf, and, what is dearer ſtill, his family and friends, to defend or ſave it, is the duty, the honour, the intereſt, and the happineſs of every citizen; it will make him venerable and beloved while he lives, be lamented and honoured if he falls in ſo glorious a cauſe, and tranſmit his name with immortal renown to the lateſt poſterity.

167 Of the people.

As the PEOPLE are the fountain of power and authority, the original ſeat of majeſty, the authors of laws, and the creators of officers to execute them; if they ſhall find the power they have conferred abuſed by their truſtees, their majeſty violated by tyranny or by uſurpation, their authority proſtituted to ſupport violence or ſcreen corruption, the laws grown pernicious through accidents unforeſeen or unavoidable, or rendered ineffectual through the infidelity and corruption of the executors of them; then it is their right, and what is their right is their duty, to reſume that delegated power, and call their truſtees to an acount; to reſiſt the uſurpation, and extirpate the tyranny; to reſtore their ſullied majeſty and proſtituted authority; to ſuſpend, alter, or abrogate thoſe laws, and puniſh their unfaithful and corrupt officers. Nor is it the duty only of the united body; but every member of it ought, according to his reſpective rank, power, and weight in the community, to concur in advancing and ſupporting theſe glorious deſigns.

Reſiſtance, therefore, being undoubtedly lawful in extraordinary emergencies, the queſtion, among good reaſoners, can only be with regard to the degree of neceſſity which can juſtify reſiſtance, and render it expedient or commendable, And here we muſt acknowledge, that, with Mr Hume *, " we ſhall always incline to their ſide that draw the bond of allegiance very cloſe, and who conſider an infringement of it as the laſt refuge in deſperate caſes, when the public is in the higheſt danger from violence and tyranny. For beſides the miſchiefs of a civil war, which commonly attends inſurrection, it is certain, that where a diſpoſition to rebellion appears among any people, it is one chief cauſe of tyranny in the rulers, and forces them into many violent meaſures, which, had every one been inclined to ſubmiſſion and obedience, they would never have embraced. Thus the *tyrannicide*, or aſſaſſination approved of by ancient maxims, inſtead of keeping tyrants and uſurpers in awe, made them ten times more fierce and unrelenting; and is now juſtly aboliſhed on that account by the laws of nations, and univerſally condemned as a baſe and treacherous method of bringing to juſtice thoſe diſturbers of ſociety."

CHAP. IV. *Duty to* GOD.

168 Divine connections.

OF all the *relations* which the human mind ſuſtains, that which ſubſiſts between the *Creator* and his *creatures*,

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* Eſſays, vol. I.

tures, the ſupreme *Lawgiver* and his *ſubjects*, is the higheſt and the beſt. This relation ariſes from the *nature* of a *creature* in general, and the *conſtitution* of the *human mind* in particular; the nobleſt powers and affections of which point to an *univerſal* mind, and would be imperfect and abortive without ſuch a direction. How lame then muſt that ſyſtem of morals be, which leaves a *Deity* out of the queſtion! How diſconſolate, and how deſtitute of its firmeſt ſupport!

169 Exiſtence of God.

It does not appear, from any true hiſtory or experience of the mind's progreſs, that any man, by any formal deduction of his diſcurſive power, ever reaſoned himſelf into the belief of a God. Whether ſuch a belief is only ſome *natural anticipation* of ſoul, or is derived from father to ſon, and from one man to another, in the way of *tradition*, or is ſuggeſted to us in conſequence of an *immutable law of our nature*, on beholding the auguſt aſpect and beautiful order of the univerſe, we will not pretend to determine. What ſeems moſt agreeable to experience is, that a *ſenſe* of its *beauty* and *grandeur*, and the *admirable fitneſs* of one thing to another in its vaſt apparatus, leads the mind *neceſſarily* and *unavoidably* to a perception of a *deſign*, or of a *deſigning cauſe*, the origin of all, by a progreſs as ſimple and natural as that by which a *beautiful picture* or a *fine building* ſuggeſts to us the idea of an *excellent artiſt*. For it ſeems to hold univerſally true, that wherever we diſcern a *tendency* or *co-operation of things towards a certain end*, or producing a common effect, there, by a neceſſary *law of aſſociation*, we apprehend *deſign*, a *deſigning energy* or *cauſe*. No matter whether the objects are *natural* or *artificial*, ſtill that ſuggeſtion is unavoidable, and the *connection* beween the *effect* and its *adequate cauſe* obtrudes itſelf on the mind, and it requires no nice ſearch or elaborate deduction of reaſon to trace or prove that connection. We are particularly ſatisfied of its truth in the ſubject before us by a kind of direct intuition; and we do not ſeem to attend to the maxim we learn in ſchools, "That there cannot be an *infinite ſeries* of *cauſes* and *effects* producing and produced by one another." That maxim is familiar only to metaphyſicians; but all men of ſound underſtanding are led to believe the exiſtence of a God. We are conſcious of our *exiſtence*, of *thought*, *ſentiment*, and *paſſion*, and ſenſible withal that theſe came not of ourſelves; therefore we immediately recogniſe a *parent-mind*, an *original intelligence*, from whom we borrowed theſe little portions of thought and activity. And while we not only feel *kind* affections in ourſelves, and diſcover them in others, but likewiſe behold round us ſuch a number and variety of creatures, endued with natures nicely adjuſted to their ſeveral ſtations and œconomies, ſupporting and ſupported by each other, and all ſuſtained by a *common order* of things, and ſharing different degrees of happineſs according to their reſpective capacities, we are naturally and neceſſarily led up to the Father of ſuch a numerous offspring, the fountain of ſuch wide-ſpread happineſs. As we conceive this Being before all, above all, and greater than all, we naturally, and without reaſoning, aſcribe to him every kind of perfection, wiſdom, power, and goodneſs without bounds, exiſting through all time, and pervading all ſpace. We apply to him thoſe glorious epithets of our *Creator*, *Preſerver*, *Benefactor*, the *ſupreme Lord* and *Lawgiver* of the whole ſociety of rational and intelligent creatures. Not only the imperfections and wants of our being and condition, but ſome of the nobleſt inſtincts and affections of our minds, connect us with this great and univerſal nature. The mind, in its progreſs from object to object, from one character and proſpect of beauty to another, finds ſome blemiſh or deficiency in each, and ſoon exhauſts or grows weary and diſſatisfied with its ſubject; it ſees no character of excellency among men equal to that pitch of eſteem which it is capable of exerting; no object within the compaſs of human things adequate to the ſtrength of its affection: nor can it ſtay any where in this ſelf-expanſive progreſs, or find repoſe after its higheſt flights, till it arrives at a Being of unbounded greatneſs and worth, on whom it may employ its ſublimeſt powers without exhauſting the ſubject, and give ſcope to the utmoſt force and fulneſs of its love without ſatiety or diſguſt. So that the nature of this Being correſponds to the nature of man; nor can his intelligent and moral powers obtain their entire end, but on the ſuppoſition of ſuch a Being, and without a real ſympathy and communication with him. The native propenſity of the mind to reverence whatever is *great* and *wonderful* in nature, finds a proper object of homage in him who ſpread out the heavens and the earth, and who ſuſtains and governs the whole of things. The *admiration* of beauty, the *love* of order, and the *complacency* we feel in goodneſs, muſt riſe to the higheſt pitch, and attain the full vigour and joy of their operations, when they unite in him who is the ſum and ſource of all perfection.

170 His relation to the human mind.

171 Immorality of impiety.

It is evident from the ſlighteſt ſurvey of morals, that how punctual ſoever one may be in performing the duties which reſult from our relations to mankind, yet to be quite deficient in performing thoſe which ariſe from our *relation* to the *Almighty*, muſt argue a ſtrange perverſion of *reaſon* or depravity of *heart*. If imperfect degrees of worth attract our veneration, and if the want of it would imply an inſenſibility, or, which is worſe, an averſion to merit, what lameneſs of affection or immorality of character muſt it be to be unaffected with, and much more to be ill-affected to, a Being of ſuperlative worth! To love ſociety, or particular members of it, and yet to have no ſenſe of our connection with its Head, no affection to our common Parent and Benefactor; to be concerned about the approbation or cenſure of our fellow-creatures, and yet to feel nothing of this kind toward him who ſees and weighs our actions with unerring wiſdom and juſtice, and can fully reward or puniſh them, betrays equal madneſs and partiality of mind. It is plain, therefore, beyond all doubt, that ſome regards are due to the great Father of all, in whom every lovely and adorable quality combines to inſpire veneration and homage

172 Right opinions of God.

As it has been obſerved already, that our *affections* depend on our *opinions* of their objects, and generally keep pace with them, it muſt be of the higheſt importance, and ſeems to be among the firſt duties we owe to the Author of our being, "to form the leaſt imperfect, ſince we cannot form perfect, conceptions of his *character* and *adminiſtration*." For ſuch *conceptions*, thoroughly imbibed, will render our *religion* rational, and our *diſpoſitions* refined. If our *opinions* are diminutive and diſtorted, our religion will be ſuper-

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ſtitious, and our temper abject. Thus, if we aſcribe to the Deity that falſe majeſty which conſiſts in the unbenevolent and ſullen exerciſe of mere *will* or *power*, or ſuppoſe him to delight in the proſtrations of ſervile fear, or as ſervile praiſe, he will be worſhipped with mean adulation and a profuſion of compliments. Farther, if he be looked upon as a ſtern and implacable Being, delightful in vengeance, he will be adored with pompous offerings, ſacrifices, or whatever elſe may be thought proper to ſoothe and mollify him. But if we believe *perfect goodneſs* to be the character of the ſupreme Being, and that he loves thoſe moſt who reſemble him moſt, the worſhip paid him will be rational and ſublime, and his worſhippers will ſeek to pleaſe him by imitating that goodneſs which they adore.

173 Rational faith.

The foundation then of all true religion is a *rational faith*. And of a rational faith theſe ſeem to be the chief articles to believe, "that an infinite all perfect Mind exiſts, who has no oppoſite nor any ſeparate intereſt from that of his creatures;—that he ſuperintends and governs all creatures and things;—that his goodneſs extends to all his creatures, in different degrees indeed, according to their reſpective natures, but wthout any partiality or envy:—that he does every thing for the beſt, or in a ſubſerviency to the perfection and happineſs of the whole: particularly that he directs and governs the affairs of men, inſpects their actions, diſtinguiſhes the *good* from the *bad*, loves and befriends the former is diſpleaſed with and pities the latter in *this* world, and will according to their reſpective deſerts reward one and puniſh the other in the next;—that in fine, he is always carrying on a ſcheme of virtue and happineſs through an unlimited duration; and is ever guiding the univerſe, through its ſucceſſive ſtages and periods, to higher degrees of perfection and felicity." This is true *Theiſm*, the glorious ſcheme of divine faith; a ſcheme exhibited in all the works of God, and executed through his whole adminiſtration.

174 Morality of theiſm.

This faith, well founded and deeply felt, is nearly connected with a *true moral taſte*, and hath a powerful efficacy on the temper and manners of the theiſt. He who admires goodneſs in others, and delights in the practice of it, muſt be conſcious of a reigning order within, a rectitude and candour of heart, which diſpoſes him to entertain favourable apprehenſions of men, and, from an impartial ſurvey of things, to preſume that *good order* and *good meaning* prevail in the univerſe; and if good meaning and good order, then an *ordering*, an *intending mind*, who is no enemy, no tyrant to his creatures, but a *friend*, a *benefactor*, an *indulgent ſovereign*.

175 Immorality of atheiſm.

On the other hand, a bad man, having nothing goodly or generous *to contemplate within*, no right intentions, nor honeſty of heart, ſuſpects every perſon and every thing: and, beholding nature through the gloom of a ſelfiſh and guilty mind, is either averſe to the belief of a reigning order, or, if he cannot ſuppreſs the unconquerable anticipations of a governing mind, he is prone to tarniſh the beauty of nature. and to impute malevolence, or blindneſs and impotence at leaſt to the Sovereign Ruler. He turns the univerſe into a forlorn and horrid waſte, and transfers his own character to the Deity, by aſcribing to him that uncommunicative grandeur, that arbitrary or revengeful ſpirit, which he affects or admires in himſelf. As ſuch a temper of mind naturally leads to *atheiſm*, or to a *ſuperſtition* full as bad; therefore, as far as that temper depends on the unhappy creature in whom it prevails, the propenſity to atheiſm or ſuperſtition conſequent thereto muſt be *immoral*. Farther, if it be true that the belief or ſenſe of a Deity is natural to the mind and the evidence of his exiſtence reflected from his works ſo full as to ſtrike even the ſuperficial obſerver with conviction, then the ſupplanting or corrupting that ſenſe, or the want of due attention to that evidence, and, in conſequence of both, a ſupine ignorance or affected unbelief of a Deity, muſt argue a bad temper or an immoral turn of mind. In the caſe of invincible ignorance, or a very bad education, tho' nothing can be concluded directly againſt the character; yet whenever ill paſſions and habits pervert the judgment, and by perverting the judgment terminate in atheiſm, then the caſe becomes plainly criminal.

176 The connection of theiſm and virtue.

But let caſuiſts determine this as they will, a true faith in the divine character and adminiſtration is generally the conſequence of a virtuous ſtate of mind. The man who is truly and habitually good, feels the *love of order*, of *beauty*, and *goodneſs*, in the ſtrongeſt degree; and therefore cannot be inſenſible to thoſe emanations of them which appear in all the works of God, nor help loving their ſupreme ſource and model. He cannot but think, that he who has poured ſuch beauty and goodneſs over all his works, muſt himſelf delight in beauty and goodneſs, and what he delights in muſt be both amiable and happy. Some indeed, there are, and it is pity there ſhould be any ſuch, who through the unhappy influence of a wrong education, have entertained dark and unfriendly thoughts of a Deity and his adminiſtration. though otherwiſe of a virtuous temper themſelves. However, it muſt be acknowledged, that ſuch ſentiments have, for the moſt part, a bad effect on the temper: and when they have not, it is becauſe the undepraved affections of an honeſt *heart* are more powerful in their operation than the ſpeculative opinions of an ill informed *head*.

177 Duties of gratitude, love, &c.

But whenever right conceptions of the Deity and his providence prevail, when he is conſidered as the inexhauſted ſource of light, and love, and joy, as acting in the joint character of a *Father* and *Governor*, imparting an endleſs variety of capacities to his creatures, and ſupplying them with every thing neceſſary to their full completion and happineſs; what veneration and gratitude muſt ſuch conceptions, thoroughly believed, excite in the mind! How natural and delightful muſt it be to one whoſe heart is open to the perception of truth, and of every thing *fair*, *great*, and *wonderful* in nature, to contemplate and adore him who is the firſt *fair*, the firſt *great*, and firſt *wonderful*; in whom *wiſdom*, *power*, and *goodneſs*, dwell vitally, eſſentially, originally, and act in perfect concert? What *grandeur* is here to fill the moſt enlarged capacity, what *beauty* to engage the moſt ardent love, what a maſs of *wonder* in ſuch exuberance of perfection to aſtoniſh and delight the human mind through an unfailing duration!

178 Other affections.

If the *Deity* is conſidered as our ſupreme *Guardian* and *Benefactor*, as the *Father of Mercies*, who loves his creatures with infinite tenderneſs, and in a particular manner all good men, nay all who delight in goodneſs, even in its moſt imperfect degrees, what reſignation,

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nation, what dependence, what generous confidence, what hope in God and his all wiſe providence, muſt ariſe in the ſoul that is poſſeſſed of ſuch amiable views of him? All thoſe exerciſes of piety, and above all a ſuperlative eſteem and love, are directed to God as to their *natural*, their *ultimate*, and indeed their only *adequate* object; and though the immenſe obligations we have received from him may excite in us more lively feelings of divine goodneſs than a general and abſtracted contemplation of it, yet the affections of *gratitude* and *love* are of themſelves of the generous diſintereſted kind, not the reſult of ſelf-intereſt, or views of reward. A perfect character, in which we always ſuppoſe infinite goodneſs, guided by unerring wiſdom, and ſupported by almighty power, is the proper object of perfect love; which, as ſuch, we are forcibly drawn to purſue and to aſpire after. In the contemplation of the divine nature and attributes, we find at laſt what the ancient philoſophers ſought in vain, the SUPREME AND SOVEREIGN GOOD; from which all other goods ariſe, and in which they are all contained. The Deity therefore challenges our ſupreme and ſovereign love, a ſentiment which, whoſoever indulges, muſt be confirmed in the love of virtue, in a deſire to imitate its all-perfect pattern, and in a cheerful ſecurity that all his great concerns, thoſe of his friends and of the univerſe, ſhall be abſolutely ſafe under the conduct of unerring wiſdom and unbounded goodneſs. It is in his care and providence alone that the good man, who is anxious for the happineſs of all, finds perfect ſerenity; a ſerenity neither ruffled by partial ill nor ſoured by private diſappointment.

179 Repentance &c.

When we conſider the unſtained purity and abſolute perfection of the *divine* nature, and reflect withal on the imperfection and various blemiſhes of our own, we muſt ſink, or be convinced we ought to ſink, into the deepeſt humility and proſtration of ſoul before him who is ſo wonderfully great and holy. When, further, we call to mind what low and languid feelings we have of the divine preſence and majeſty, what inſenſibility of his fatherly and univerſal goodneſs, nay, what ungrateful returns we have made to it, how far we come ſhort of the perfection of his law and the dignity of our own nature, how much we have indulged to the ſelfiſh paſſions, and how little to the benevolent ones; we muſt be conſcious that it is our duty to repent of a temper and conduct ſo unworthy our nature and unbecoming our obligations to its Author, and to reſolve and endeavour to act a wiſer and better part for the future,

180 Hopes of pardon.

Nevertheleſs, from the character which his works exhibit of him, from thoſe delays or alleviations of puniſhment which offenders often experience, and from the merciful tenor of his adminiſtration in many other inſtances, the ſincere penitent may entertain good hopes that his Parent and Judge will not be ſtrict to mark iniquity, but will be propitious and favourable to him, if he honeſtly endeavours to avoid his former practices, and ſubdue his former habits, and to live in a greater conformity to the divine will for the future. If any doubts or fears ſhould ſtill remain, how far it may be conſiſtent with the rectitude and equity of the divine government to let his iniquities paſs unpuniſhed, yet he cannot think it unſuitable to his paternal clemency and wiſdom to contrive a method of retrieving the penitent offender, that ſhall maintain and reconcile the majeſty and mercy of his government. If reaſon cannot of itſelf ſuggeſt ſuch a ſcheme, it gives at leaſt ſome ground to expect it. But though *natural religion* cannot let in moral light and aſſurance on ſo intereſting a ſubject, yet it will teach the humble theiſt to wait with great ſubmiſſion for any farther intimation it may pleaſe the ſupreme Governor to give of his will; to examine with candour and impartiality whatever evidence ſhall be propoſed to him of a *divine revelation*, whether that evidence is *natural* or *ſupernatural;* to embrace it with veneration and cheerfulneſs, if the evidence is clear and convincing; and finally, if it bring to light any *new relations* or *connections*, *natural religion* will perſuade its ſincere votary faithfully to comply with the *obligations*, and perform the *duties* which reſult from thoſe relations and connections. This is *theiſm*, *piety*, the *completion of morality!*

181 Worſhip, praiſe, thankſgiving.

We muſt farther obſerve, that all thoſe affections which we ſuppoſed to regard the Deity as their *immediate* and *primary* object, are vital energies of the ſoul, and conſequently exert themſelves into act, and, like all other energies, gain ſtrength or greater activity by that exertion. It is therefore our *duty* as well as higheſt *intereſt*, often at ſtated times, and by decent and ſolemn acts, to contemplate and adore the great Original of our exiſtence, the Parent of all beauty and of all good; to expreſs our veneration and love by an awful and devout recognition of his perfections; and to evidence our gratitude by celebrating his goodneſs, and thankfully acknowledging all his benefits. It is likewiſe our duty, by proper exerciſes of ſorrow and humiliation, to confeſs our ingratitude and folly; to ſignify our dependence on God, and our confidence in his goodneſs, by imploring his bleſſing and gracious concurrence in aſſiſting the weakneſs and curing the corruptions of our nature; and finally, to teſtify our ſenſe of his authority, and our faith in his government, by devoting ourſelves to do his will, and reſigning ourſelves to his diſpoſal. Theſe duties are not therefore obligatory, becauſe the Deity needs or can be profited by them; but as they are apparently *decent* and *moral*, ſuitable to the relations he ſuſtains of our *Creator*, *Benefactor*, *Lawgiver*, and *Judge;* expreſſive of our ſtate and obligations; and improving to our tempers, by making us more rational, ſocial, god-like, and conſequently more happy.

182 External worſhip.

We have now conſidered INTERNAL piety, or the *worſhip of the mind*, that which is in ſpirit and in truth; we ſhall conclude the ſection with a ſhort account of that which is EXTERNAL. *External* worſhip is founded on the ſame principles as *internal*, and of as ſtrict moral obligation. It is either *private* or *public*. *Devotion* that is *inward*, or *purely intellectual*, is too ſpiritual and abſtracted an operation for the bulk of mankind. The operations of their minds, ſuch eſpecially as are employed on the moſt ſublime, immaterial objects, muſt be aſſiſted by their outward organs or by ſome help from the imagination; otherwiſe they will ſoon be diſſipated by ſenſible impreſſions, or grow tireſome if too long continued. Ideas are ſuch fleeting things, that they muſt be fixed; and ſo ſubtle, that they muſt be expreſſed and delineated, as it were, by ſenſible marks and images; otherwiſe we cannot

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attend to them nor be much affected by them. *The expreſſive verbal addreſs, prayer praiſe, thankſgiving,* and *confeſſion,* are admirable aids to *inward* devotion, fix our attention, compoſe and enliven our thoughts, impreſs us more deeply with a ſenſe of the awful preſence in which we are, and, by a natural and mechanical ſort of influence, tend to heighten thoſe devout feelings and affections which we ought to entertain, and after this manner reduce into formal and explicit act.

183 Public worſhip.

This holds true in an higher degree in the caſe of *public* worſhip, where the preſence of our fellow-creatures, and the powerful contagion of the *ſocial* affections, conſpire to kindle and ſpread the devout flame with greater warth and energy. To conclude; As *God* is the *parent* and *head* of the *ſocial ſyſtem*, as he has formed us for a *ſocial ſtate*, as by *one* we find the beſt ſecurity againſt the ills of life, and in the *other* enjoy its greateſt comforts, and as, by means of *both*, our nature attains its higheſt improvemenis and perfection; and moreover, as there are *public bleſſings* and *crimes* in which we all ſhare in ſome degree, and *public wants* and *dangers* to which all are expoſed—it is therefore evident, that the various and ſolemn offices of *public religion* are duties of indiſpenſable moral obligation, among the beſt cements of ſociety, the firmeſt prop of government, and the faireſt ornament of both.

PART III.

Chap. I. *Of* Practical Ethics, *or the* Culture *of the* Mind.

184 Dignity and importance of the ſubject.

We have now gone through a particular detail of the ſeveral duties we owe to Ourselves, to Society, and to God. In conſidering the *firſt order* of duties, we juſt touched on the methods of acquiring the different kinds of goods which we are led by nature to purſue; only we left the conſideration of the method of acquiring the *moral* goods of the mind to a chapter by itſelf, becauſe of its ſingular importance. This chapter then will contain a brief enumeration of the arts of acquiring *virtuous habits*, and of eradicating *vicious ones*, as far as is conſiſtent with the brevity of ſuch a work: a ſubject of the utmoſt difficulty as well as importance in morals; to which, nevertheleſs, the leaſt attention has been generally given by *moral* writers. This will properly follow a detail of duty, as it will direct us to ſuch *means* or *helps* as are moſt neceſſary and conducive to the practice of it.

185 Senſible ideas and ſenſible taſte.

In the firſt part of this inquiry we traced the order in which the paſſions ſhoot up in the different periods of human life. That order is not accidental, or dependent on the caprice of men, or the influence of cuſtom and education, but ariſes from the original conſtitution and laws of our nature; of which this is one, viz. "That ſenſible objects make the firſt and ſtrongeſt impreſſions on the mind." Theſe, by means of our outward organs, being conveyed to the mind, become objects of its attention, on which it reflects when the outward objects are no longer preſent, or in other words, when the impreſſions upon the outward organs ceaſe. Theſe objects of the mind's reflection are called *ideas* or *notions*. Towards theſe, by another law of our nature, we are not altogether indifferent; but correſpondent movements of *deſire* or *averſion, love* or *hatred*, ariſe, according as the objects which they denote made an agreeable or diſagreeable impreſſion on our organs. Theſe *ideas* and *affections* which we experience in the *firſt* period of life, we refer to the *body*, or to *ſenſe*; and the *taſte* which is formed towards them, we call a *ſenſible*, or a merely *natural taſte*; and the objects correſponding to them we in general call *good* or *pleaſant*.

But as the mind moves forward in its courſe, it extends its views, and receives a new and more *complex* ſet of ideas, in which it obſerves *uniformity*, variety, *ſimilitude, ſymmetry of parts, reference to an end, novelty, grandeur*. Theſe compoſe a vaſt train and diverſity, of *imagery*, which the mind compounds, divides, and moulds into a thouſand forms, in the abſence of thoſe objects which firſt introduced it. And this more complicated imagery ſuggeſts a new train of *deſires* and *affections*, full as ſprightly and engaging as any which have yet appeared. This whole claſs of *perceptions* or *impreſſions* is referred to the *imagination*, and forms an higher taſte than the *ſenſible*, and which has an immediate and mighty influence on the *finer* paſſions of our nature, and is commonly termed a *fine taſte*.

186 Ideas of beauty and a fine taſte.

The objects which correſpond to this taſte we uſe to call *beautiful, great, harmonious*, or *wonderful*, or in general by the name of *beauty*.

187 Moral ideas and a moral taſte.

The mind, ſtill puſhing onwards and increaſing its ſtock of ideas, aſcends from thoſe to an higher ſpecies of objects, viz. the *order* and *mutual relations* of *minds* to each other, their reciprocal *affections, characters, actions*, and various *aſpects*. In theſe it diſcovers a *beauty* a *grandeur*, a *decorum*, more intereſting and alluring than any of the former kinds. Theſe objects, or the notions of them, paſſing in review before the mind, do, by a neceſſary law of our nature, call forth another and nobler ſet of affections, as *admiration, eſteem, love, honour, gratitude, benevolence*, and others of the like tribe. This claſs of *perfections*, and their correſpondent *affections*, we refer, becauſe of their objects *(manners)*, to a *moral* ſenſe, and call the *taſte* or *temper* they excite, *moral*. And the objects which are agreeable to this *taſte* or *temper* we denominate by the general name of *moral beauty*, in order to diſtinguiſh it from the other which is termed *natural*.

188 Sources of aſſociation.

Theſe different ſets of *ideas* or *notions* are the materials about which the mind employs itſelf, which it blends, ranges, and diverſifies ten thouſand different ways. It feels a ſtrong propenſion to connect and aſſociate thoſe ideas among which it obſerves any *ſimilitude* or any *aptitude*, whether *original* and *natural*, or *cuſtomary* and *artificial*, to ſuggeſt each other. See Metaphysics.

189 Laws of aſſociation.

But whatever the reaſons are, whether *ſimilitude, co-exiſtence, cauſality*, or any other *aptitude* or *relation*, why any two or more ideas are connected by the mind at firſt, it is an eſtabliſhed law of our nature, "that when two or more ideas have often ſtarted in company, they form ſo ſtrong an union, that it is very difficult ever after to ſeparate them." Thus the *lover* cannot ſeparate the idea of *merit* from his *miſtreſs*; the *courtier* that of *dignity* from his *title* or *ribbon*; the *miſer* that of *happineſs* from his *bags*. It is theſe aſſociations of *worth* or *happineſs* with any of the different ſets of *objects* or *images* before ſpecified, that form our *taſte* or *complex idea* or *good*. By another law of our nature, "our *affections* follow and are governed by this *taſte*. And to theſe *affections* our *character* and *conduct* are ſimilar and proportioned; on the general tenor of which our *happineſs* principally depends.'

190 Leading paſſions follow taſte.

As all our *leading* paſſions then depend on the direction which our *taſte* takes, and as it is always of the ſame ſtrain with our *leading* aſſociations, it is worth while to inquire a little more particularly how theſe are formed, in order to detect the ſecret ſources from whence our paſſions derive their principal ſtrength, their various riſes and falls. For this will give us the true key to their management, and let us into the right method of correcting the *bad* and improving the *good*.

191 The importance and uſe of the imagination.

No kind of objects make ſo powerful an impreſſion on us as thoſe which are immediately impreſſed on our *ſenſes*, or ſtrongly painted on our *imaginations*. Whatever is purely *intellectual*, as abſtracted or ſcientific truths, the ſubtle relations and differences of things, has a fainter ſort of exiſtence in the mind; and though it may exerciſe and whet the *memory*, the *judgment*, or the *reaſoning power*, gives hardly any impulſe at all to the *active* powers, the *paſſions*, which are the main ſprings of motion. On the other hand, were the mind entirely under the direction of *ſenſe*, and impreſſible only by ſuch objects as are preſent, and ſtrike ſome of the outward organs, we ſhould then be preciſely in the ſtate with the brute creation, and be governed ſolely by *inſtinct* or *appetite*, and have no power to controul whatever impreſſions are made upon us: Nature has therefore endued us with a *middle faculty*, wonderfully adapted to our *mixed* ſtate, which holds partly of *ſenſe* and partly of *reaſon*, being ſtrongly allied to the *former*, and the common receptacle in which all the notices that come from that quarter are treaſured up; and yet greatly ſubſervient and miniſterial to the *latter*, by giving a body, a coherence, and beauty to its conceptions. This *middle* faculty is called the *imagination*, one of the moſt buſy and fruitful powers of the mind. Into this common ſtorehouſe are likewiſe carried all theſe *moral forms* which are derived from our *moral faculties* of perception; and there they often undergo new changes and appearances, by being mixed and wrought up with the ideas and forms of *ſenſible* or *natural* things. By this coalition of imagery, *natural beauty*, is dignified and heightened by *moral qualities* and *perfections*, and *moral qualities* are at once exhibited and ſet off by *natural beauty*. The *ſenſible* beauty, or good, is refined from its droſs by partaking of the *moral*; and the *moral* receives a ſtamp, a viſible character and currency, from the *ſenſible*

192 Its energy in various inſtances in heightening ſenſible pleaſures.

As we are firſt of all accuſtomed to *ſenſible* impreſſions and *ſenſible* enjoyments, we contract early a *ſenſual reliſh* or *love of pleaſure*, in the lower ſenſe of the word. In order, however, to juſtify this reliſh, the mind, as it becomes open to *higher* perceptions of *beauty* and *good*, borrows from thence a noble ſet of *images*, as *fine taſte*, *generoſity*, *ſocial affections*, *friendſhip*, *good fellowſhip*, and the like; and, by dreſſing out the old purſuits with theſe new ornaments, gives them an additional dignity and luſtre. By theſe ways the *deſire of a table*, *love of finery*, *intrigue*, and *pleaſure*, are vaſtly increaſed beyond their natural pitch, having an impulſe combined of the force of the *natural* appetites, and of the ſuperadded ſtrength of thoſe *paſſions* which tend to the *moral ſpecies*.

193 In heightening the pleaſures of beauty, harmony, &c.

When the mind becomes more ſenſible to thoſe objects or appearances in which it perceives *beauty*, *uniformity*, *grandeur*, and *harmony*, as fine clothes, elegant furniture, plate, pictures, gardens, houſes, equipages, the beauty of animals, and particularly the attractions of the ſex; to theſe objects the mind is led by *nature* or taught by *cuſtom*, the *opinion* and example of others, to annex certain ideas of *moral character*, *dignity*, *decorum honour*, *liberality*, *tenderneſs*, and *active* or *ſocial enjoyment*. The conſequence of this aſſociation is, that the objects to which theſe are annexed muſt riſe in their value, and be purſued with proportionable ardour. The *enjoyment* of them is often attended with *pleaſure*; and the mere *poſſeſſion* of them, where that is wanting, frequently draws reſpect from one's fellow-creatures: This *reſpect* is, by many, thought equivalent to the pleaſure of *enjoyment*. Hence it happens that the idea of *happineſs* is connected with the mere *poſſeſſion*, which is therefore eagerly ſought after, without any regard to the *generous uſe* or *honourable enjoyment*. Thus the paſſion reſting on the *means*, not the *end*, i. e. loſing ſight of its *natural* object, becomes wild and extravagant.

194 In raiſing the value of external ſymbols, &c.

In fine, any *object*, or *external denomination*, a *ſtar*, a *garter*, a *cup*, a *crown*, a *title*, may become a *moral* badge or emblem of *merit*, *magnificence*, or *honour*, according as theſe have been found or thought by the poſſeſſors or admirers of them, to accompany them; yet by the deception formerly mentioned, the *merit* or the *conduct* which intitled, or ſhould intitle to thoſe marks of diſtinction, ſhall be forgot or neglected, and the *badges* themſelves be paſſionately affected or purſued, as including every excellency. If theſe are attained by any means, all the concomitants which *nature*, *cuſtom*, or *accidents* have joined to them, will be ſuppoſed to follow of courſe. Thus, *moral ends*, with which the unhappy admirer is apt to colour over his paſſion and views, will, in his opinion, juſtify the moſt *immoral means*, as *proſtitution*, *adulation fraud treachery*, and every ſpecies of *knavery*, whether more open or more diſguiſed.

195 In heightening the value of wealth, power, &c.

When men are once engaged in *active* life, and find that *wealth* and *power*, generally called INTEREST, are the great avenues to every kind of enjoyment, they are apt to throw in many engaging *moral forms* to the object of their purſuit, in order to juſtify their paſſion, and varniſh over the meaſures they take to gratify it, as *independency on the vices* or *paſſions* of others, *proviſion* and *ſecurity to themſelves* and *friends*, *prudent œconomy*, or *well placed charity*, *ſocial communication*, *ſuperiority to their enemies*, who are all villains, *honourable ſervice*, and many other ingredients of *merit*. To attain ſuch capacities of *uſefulneſs* or *enjoyment*, what arts, nay what meanneſſes, can be thought blameable by theſe cool purſuers of intereſt?—Nor have they whom the gay world is pleaſed to indulge with the title of *men of pleaſure*, their imaginations leſs pregnant with *moral images*, with which they never fail to embelliſh, or, if they cannot do that, to palliate their groſs purſuits. Thus *admiration of wit*, of *fine parts* and *genius*, *friendſhip*, *love*, *generous ſympathy*, *mutual confidence*, *giving* and *receiving pleaſure*, are the ordinary ingredients with which they ſeaſon their gallantry and pleaſurable entertainments; and by which they impoſe on themſelves, and endeavour to impoſe on others, that *their amours* are the joint iſſue of good ſenſe and virtue.

196
Its influence on all the paſſions.

Theſe *aſſociations*, variouſly combined and proportioned by the *imagination*, form the chief *private* paſſions, which govern the lives of the generality, as the *love of action*, of *pleaſure*, *power*, *wealth*, and *fame*; they influence the *defenſive*, and affect the *public paſſions*, and raiſe *joy* or *ſorrow* as they are gratified or diſappointed. So that in effect theſe aſſociations of *good* and *evil*, *beauty* and *deformity*, and the paſſions they raiſe, are the main *hinges of life* and *manners*, and the great *ſources* of our *happineſs* or *miſery*. It is evident, therefore, that the whole of *moral culture* muſt depend on giving a right direction to the *leading paſſions*, and duly proportioning them to the *value* of the *objects* or *goods* purſued, under what name ſoever they may appear.

197
Moral culture, by correcting our taſte or imagination.

Now, in order to give them this *right direction* and *due proportion*, it appears, from the foregoing detail, that thoſe *aſſociations* of ideas, upon which the paſſions depend, muſt be *duly* regulated; that is to ſay, as an exorbitant paſſion for *wealth pleaſure*, or *power*, flows from an *aſſociation* or *opinion* that more *beauty* and *good*, whether *natural* or *moral*, enters into the enjoyment or poſſeſſion of them, than really belongs to either; *therefore*, in reſtoring thoſe paſſions to their juſt proportion, we muſt begin with correcting the *opinion*, or breaking the *falſe aſſociation*, or, in other words, we muſt decompound the *complex phantom* of *happineſs* or *good*, which we fondly admire; diſunite thoſe ideas that have no natural alliance; and ſeparate the *original* idea of *wealth*, *power*, or *pleaſure*, from the foreign mixtures incorporated with it, which enhance its value, or give it its chief power to enchant and ſeduce the mind. For inſtance, let it be conſidered how poor and inconſiderable a thing *wealth* is, if it be disjoined from *real uſe*, or from ideas of *capacity* in the poſſeſſor *to do good*, from *independency*, *generoſity*, *proviſion for a family* or *friends*, and *ſocial communication* with others. By this *ſtandard* let its true value be fixed; let its miſapplication, or unbenevolent enjoyment, be accounted ſordid and infamous; and nothing worthy or eſtimable be aſcribed to the *mere poſſeſſion* of it, which is not borrowed from its *generous uſe*.

198
By ſelf denial, and a counter-proceſs.

If that *complex* form of *good* which is called *pleaſure* engage us, let it be analyſed into its conſtituent principles, or thoſe allurements it draws from the *heart* and *imagination*,, in order to heighten the low part of the indulgence; let the *ſeparate* and *comparative* moment of each be diſtinctly aſcertained and deduced from that groſs part, and this remainder of the accumulated enjoyment will dwindle down into a poor, inſipid, tranſitory thing. In proportion as the *opinion* of the *good* purſued abates, the *admiration* muſt decay, and the *paſſions* loſe ſtrength of courſe. One effectual way to lower the *opinion*, and conſequently to weaken the habit founded upon it, is to practiſe the leſſer pieces of ſelf-denial, or to abſtain, to a certain pitch, from the purſuit or enjoyment of the favourite object; and that this may be the more eaſily accompliſhed, one muſt avoid thoſe occaſions, that company, thoſe places, and the other circumſtances, that inflamed *one* and endeared the *other*. And, as a *counter-proceſs*, let *higher* or even *different* enjoyments be brought in view, other paſſions played upon the former, different places frequented, other exerciſes tried, company kept with perſons of a different or more correct way of thinking, both in *natural* and *moral* ſubjects.

199
By a ſound and virtuous education.

As much depends on our ſetting out well in life, let the *youthful* fancy, which is apt to be very florid and luxuriant, be early accuſtomed by *inſtruction*, *example*, and ſignificant *moral exerciſes*, nay, by looks, geſtures, and every other teſtimony of approbation or blame, to annex ideas of *merit*, *honour*, and *happineſs*, not to *birth, dreſs, rank, beauty, fortune, power, popularity*, and the like *outward* things, but to *moral* and *truly virtuous qualities*, and to thoſe *enjoyments* which ſpring from a well-informed judgement and a regular conduct of the affections, eſpecially thoſe of the *ſocial* and *diſintereſted* kind. Such dignified forms of *beauty* and *good*, often ſuggeſted, and, by moving pictures and examples warmly recommended to the *imagination*, enforced by the authority of *conſcience*, and demonſtrated by *reaſon* to be the ſureſt means of enjoyment, and the only independent, undeprivable, and durable goods, will be the beſt counterbalance to meaner paſſions, and the firmeſt foundation and ſecurity to virtue.

200
By rightly ſtudying human nature.

It is of great importance to the forming a *juſt taſte*, or pure and large conceptions of happineſs, to ſtudy and underſtand *human nature* well, to remember what a complicated ſyſtem it is, particularly to have deeply imprinted on our mind that GRADATION of *ſenſes*, *faculties*, and *powers of enjoyment* formerly mentioned, and the *ſubordination* of *goods* reſulting from thence, which nature points out, and the experience of mankind confirms. Who when they think ſeriouſly, and are not under the immediate influence of ſome violent prejudice or paſſion, prefer not the pleaſures of *action*, *contemplation*, *ſociety*, and moſt *exerciſes* and *joys* of the *moral* kind, as *friendſhip*, *natural affection*, and the like, to all *ſenſual* gratifications whatſoever? Where the different ſpecies of pleaſure are blended into *one complex form*, let them be accurately diſtinguiſhed, and be referred each to its proper *faculty* and *ſenſe*, and examined apart what they have peculiar, what common with others, and what foreign and adventitious. Let *wealth*, *grandeur*, *luxury*, *love*, *fame*, and the like, be tried by this teſt, and their true alloy will be found out.

201
By comparing the moment and abatements of different goods.

Let it be farther conſidered, whether the mind may not be eaſy and enjoy itſelf greatly, though it want many of thoſe elegancies and ſuperfluities of life which ſome poſſeſs, or that load of wealth and power which others eagerly purſue, and under which they groan. Let the difficulty of attaining, the precariouſneſs of poſſeſſing, and the many abatements in enjoying overgrown wealth and envied greatneſs, of which the weary profeſſors ſo frequently complain, as the hurry of buſineſs, the burden of company, of paying attendance to the *few*, and giving it to the *many*, the cares of keeping, the fears of loſing, and the deſires of encreaſing what they have, and the other troubles which accompany this pitiful drudgery and pompous ſervitude; let theſe and the like circumſtances be often conſidered, that are conducive to the removing or leſſening the *opinion* of ſuch goods, and the attendant *paſſion* or *ſet* of *paſſions* will decay of courſe.

202
By obſerving our own bent and character, &c.

Let the peculiar bent of our nature and character be obſerved, whether we are moſt inclined to form aſſociations and reliſh objects of the *ſenſible*, *intellectual*, or *moral* kind. Let that which has the aſcendant be particularly watched; let it be directed to right objects, be improved by proportioned exerciſes, and guarded by proper checks from an oppoſite quarter. Thus the *ſenſible* turn may be exalted by the *intellectual*, and a taſte for the beauty of the *fine arts*, and both may be made ſubſervient to convey and rivet ſentiments highly *moral* and *public-ſpirited*. This inward ſurvey muſt extend to the *ſtrength* and *weakneſſes* of one's *nature*, one's *conditions*, *connections*, *habitudes*, *fortune*, *ſtudies*, *acquaintance*, and the other circumſtances of one's life, from which every man will form the juſteſt eſtimate of his own diſpoſitions and character, and the beſt rules for correcting and improving them. And in order to do this with more advantage, let thoſe *times* or *critical ſeaſons* be watched when the mind is beſt diſpoſed towards a change; and let them be improved by rigorous *reſolutions*, *promiſes*, or whatever elſe will engage the mind to perſevere in virtue. Let the *conduct*, in fine, be often reviewed, and the *cauſe*, of its *corruption* or *improvement* be carefully obſerved.

203
By frequent moral exerciſes.

It will greatly conduce to refine the *moral taſte*, and ſtrengthen the *virtuous temper*, to accuſtom the mind to the frequent exerciſe of *moral ſentiments* and *determinations*, by reading *hiſtory*, *poetry*, particularly of the *pictureſque* and *dramatic* kind; the ſtudy of the *fine arts*; by converſing with the moſt eminent for good ſenſe and virtue; but, above all, by frequent and repeated acts of *humanity*, *compaſſion*, *friendſhip*, *politeneſs*, and *hoſpitality*. It is exerciſe that gives health and ſtrength. He that reaſons moſt frequently becomes the wiſeſt, and moſt enjoys the pleaſures of wiſdom. He who is moſt often affected by objects of compaſſion in poetry, hiſtory, or real life, will have his ſoul moſt open to pity, and its delightful pains and duties. So he alſo who practiſes moſt diligently the offices of kindneſs and charity, will by it cultivate that diſpoſition from whence all his pretenſions to perſonal merit muſt ariſe, his preſent and his future happineſs.

204
By an honeſt employment.

An uſeful and honourable employment in life will adminiſter a thouſand opportunities of this kind, and greatly ſtrengthen a ſenſe of virtue and good affections, which muſt be nouriſhed by right training, as well as our underſtanding. For ſuch an employment, by enlarging one's experience, giving an habit of attention and caution, or obliging one, from neceſſity or intereſt, to keep a guard over the paſſions, and ſtudy the outward decencies and appearances of virtue, will by degrees produce good habit, and at length inſinuate the love of virtue and honeſty for its own ſake.

205
By viewing men and manners in a fair light.

It is a great inducement to the exerciſe of benevolence to view *human nature* in a favourable light, to obſerve the characters and circumſtances of mankind on the *faireſt* ſides, to put the beſt conſtruction on their actions they will bear, and to conſider them as the reſult of *partial* and *miſtaken*, rather than *ill* affections, or, at worſt, as the exceſſes of a pardonable ſelf love, ſeldom or never the effect of pure malice.

206
By conſideration and pious exerciſes.

Above all, the *nature* and *conſequences* of *virtue* and *vice*, their conſequences being the law of our nature and will of heaven; the light in which they appear to our ſupreme *Parent* and *Lawgiver*, and the reception they will meet with from him, muſt be often attended to. The exerciſes of *piety*, as *adoration*, and *praiſe* of the *divine* excellency, *invocation* of and *dependence* on his aid, *confeſſion*, *thankſgiving*, and and *reſignation*, are habitually to be indulged, and frequently performed, not only as *medicinal*, but highly *improving* to the temper.

207
By juſt views of human life, and its connection with a future.

To conclude: it will be of admirable efficacy towards eradicating *bad* habits, and implanting *good* ones, frequently to contemplate *human life* as the great *nurſery* of our *future* and *immortal exiſtence*, as that *ſtate* of *probation* in which we are to be *educated* for a *divine life*: to remember, that our *virtues* or *vices* will be *immortal* as ourſelves, and influence our *future* as well as our *preſent* happineſs,—and therefore, that every diſpoſition and action is to be regarded as pointing beyond the *preſent* to an *immortal* duration.—An habitual attention to this wide and important *connection* will give a vaſt compaſs and dignity to our ſentiments and actions, a noble ſuperiority to the pleaſures and pains of life, and a generous ambition to make our *virtue* as *immortal* as our *being*.

CHAP. II. *Motives to* VIRTUE *from Perſonal* HAPPINESS.

208
Motives from perſonal happineſs.

We have already conſidered our *obligations* to the practice of *virtue*, ariſing from the *conſtitution* of our nature, by which we are led to *approve* a certain *order* and *œconomy* of *affections*, and a certain *courſe of action* correſpondent to it †. But, beſides this, there are ſeveral motives which ſtrengthen and ſecure virtue, though not themſelves of a *moral* kind. Theſe are, its *tendency to perſonal happineſs*, and the *contrary tendency of vice*. "Perſonal happineſs ariſes either from the ſtate of a man's own mind, or from the ſtate and diſpoſition of external cauſes towards him."

† Vide Part I. chap. iii. &c.

209
Happineſs of virtue from within.

We ſhall firſt exammine the "tendency of virtue to happineſs with reſpect to the ſtate of a man's own mind," This is a point of the utmoſt conſequence in morals, becauſe, unleſs we can convince ourſelves, or ſhow to others, that, by doing our *duty*, or fulfilling our *moral obligations*, we conſult the greateſt ſatisfaction of our own mind, or our higheſt intereſt on the whole, it will raiſe ſtrong and often unſurmountable prejudices againſt the practice of virtue, eſpecially whenever there ariſes any appearance of *oppoſition* between our *duty* and our *ſatisfaction* or *intereſt*. To creatures ſo deſirous of happineſs, and averſe to miſery, as we are, and often ſo oddly ſituated amidſt contending paſſions and intereſts, it is neceſſary that virtue appear not only an *honourable* but a *pleaſing* and *beneficent* form. And in order to juſtify our choice to ourſelves as well as before others, we muſt ourſelves feel and be able to avow in the face of the whole world, that her ways are ways of pleaſantneſs, and her paths the paths of peace. This will ſhow, beyond all contradiction

Motives to Virtue.

tradition, that we not only approve, but can give a ſufficient reaſon for what we do.

210 Influence of vice on the temper of the mind

Let any man in a cool hour, when he is diſengaged from buſineſs, and undiſturbed by paſſion (as ſuch cool hours will ſometimes happen), ſit down, and ſeriouſly reflect with himſelf what ſtate or temper of mind he would chooſe to feel and indulge, in order to be eaſy and to enjoy himſelf. Would he chooſe, for that purpoſe, to be in a conſtant diſſipation and hurry of thought; to be diſturbed in the exerciſe of his reaſon; to have various and often interfering phantoms of good playing before his imagination, ſoliciting and diſtracting him by turns, now ſoothing him with amuſing hopes, then torturing him with anxious fears; and to approve this minute what he ſhall condemn the next? Would he chooſe to have a ſtrong and painful ſenſe of every petty injury? quick apprehenſions of every impending evil, inceſſant and inſatiable deſires of power, wealth, honour, pleaſure; an irreconcileable antipathy againſt all competitors and rivals; inſolent and tyrannical diſpoſitions to all below him; fawning, and at the ſame time envious, diſpoſitions to all above him: with dark ſuſpicions and jealouſies of every mortal? Would he chooſe neither to love nor be beloved of any; to have no friend in whom to confide, or with whom to interchange his ſentiments or deſigns; no favourite, on whom to beſtow his kindneſs, or vent his paſſions; in fine, to be conſcious of no merit with mankind, no eſteem from any creature, no good affection to his Maker, no concern for, nor hopes of, his approbation: but, inſtead of all theſe, to hate, and know that he is hated, to condemn, and know that he is condemned by all; by the good, becauſe he is ſo unlike: and by the bad, becauſe he is ſo like themſelves; to hate or to dread the very Being that made him: and, in ſhort, to have his breaſt the ſeat of pride and paſſion, petulance and revenge, deep melancholy, cool malignity, and all the other furies that ever poſſeſſed and tortured mankind?—Would our calm inquirer after happineſs pitch on ſuch a ſtate, and ſuch a temper of mind, as the moſt likely means to put him in poſſeſſion of his deſired eaſe and ſelf-enjoyment?

211 Influence of virtue on the temper.

Or would he rather chooſe a ſerene and eaſy flow of thought: a reaſon clear and compoſed; a judgment unbiaſſed by prejudice, and undiſtracted by paſſion; a ſober and well governed fancy, which preſents the images of things true, and unmixed with deluſive and unnatural charms, and therefore adminiſters no improper or dangerous fuel to the paſſions, but leaves the mind free to chooſe or reject, as becomes a reaſonable creature: a ſweet and ſedate temper, not eaſily ruffled by hopes or fears, prone neither to ſuſpicion nor revenge, apt to view men and things in the faireſt lights, and to bend gently to the humours of others rather than obſtinately to contend with them? Would he chooſe ſuch moderation and continence of mind, as neither to be ambitious of *power*, fond of *honours*, covetous of *wealth*, nor a ſlave to *pleaſure*; a mind of courſe neither elated with ſucceſs, nor dejected with diſappointment; ſuch a modeſt and noble ſpirit as ſupports power without inſolence, wears honour without pride, uſes wealth without profuſion or parſimony; and rejoices more in giving than in receiving pleaſure; ſuch fortitude and equanimity as riſes above misfortunes, or turns them into bleſſings: ſuch integrity

From Happineſs.

and greatneſs of mind, as neither flatters the vices, nor triumphs over the follies of men; as equally ſpurns ſervitude and tyranny, and will neither engage in low deſigns, nor abet them in others? Would he chooſe, in fine, ſuch mildneſs and benignity of heart as takes part in all the joys, and refuſes none of the ſorrows, of others: ſtands well affected to all mankind; is conſcious of meriting the eſteem of all, and of being beloved by the beſt: a mind which delights in doing good without any ſhew, and yet arrogates nothing on that account: rejoices in loving and being beloved by its Maker, acts ever under his eye, reſigns itſelf to his providence, and triumphs in his approbation?—Which of theſe diſpoſitions would be his choice, in order to be contented, ſerene, and happy?—The *former* temper is VICE, the *latter* VIRTUE. Where *one* prevails, there MISERY prevails, and by the generality is acknowledge to prevail. Where the *other* reigns, there HAPPINESS reigns, and by the confeſſion of mankind it acknowledged to reign. The *perfection* of either temper is *miſery* or *happineſs in perfection*.—THEREFORE, every *approach* to *either extreme* is an *approach* to *miſery* or to *happineſs*; *i. e.* every *degree* of *vice* or *virtue* is accompanied with a *proportionate degree* of *miſery* or *happineſs*.

212 The alleviations of his ills.

The principal alleviations of a virtuous man's calamities are theſe:—That though ſome of them may have been the effect of his imprudence or weakneſs, yet few of them are ſharpened by a ſenſe of guilt, and none of them by a conſciouſneſs of wickedneſs, which ſurely is their keeneſt ſting;—that they are common to him with the beſt of men;—that they ſeldom or never attack him quite unprepared, but rather guarded with a conſciouſneſs of his own ſincerity and virtue, with a faith and truſt in providence, and a firm reſignation to its perfect orders;—that they may be improved as means of correction, or materials to give ſcope and ſtability to his virtues;—and, to name no more, they are conſiderably leſſened, and often ſweetened to him, by the general ſympathy of the wiſe and good.

213 His enjoyments.

His enjoyments are more numerous, or, if leſs numerous, yet more intenſe than thoſe of the bad man; for he ſhares in the joys of others by rebound; and every increaſe of *general* or *particular* happineſs is a real addition to his own. It is true, his friendly *ſympathy* with others ſubjects him to ſome pains which the hard-hearted wretch does not feel: yet to give a looſe to it, is a kind of agreeable diſcharge. It is ſuch a ſorrow as he loves to indulge; a ſort of pleaſing anguiſh that ſweetly melts the mind, and terminates in a ſelf-approving joy. Though the good man may want means to execute, or be diſappointed in the ſucceſs of his benevolent purpoſes; yet, as was formerly* obſerved, he is ſtill conſcious of good affection, and that conſciouſneſs is an enjoyment of a more delightful ſavour than the greateſt triumphs of ſucceſsful vice. If the *ambitious*, *covetous*, or voluptuous, are diſappointed, their paſſions recoil upon them with a fury proportioned to their opinion of the value of what they purſue, and their hope of ſucceſs; while they have nothing within to balance the diſapppointment, unleſs it is an uſeleſs fund of pride, which, however, *frequently* turns mere accidents into mortifying affronts, and exalts grief into rage and frenzy. Whereas the meek, humble,

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* See Part II. chap. ii.

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humble, and benevolent temper, is its own reward, is ſatisfied from within; and, as it magnifies greatly the pleaſure of ſucceſs, ſo it wonderfully alleviates, and in a manner annihilates, all pain for the want of it.

214 From merited eſteem and ſympathy.

As the good man is conſcious of loving and wiſhing well to all mankind, he muſt be ſenſible of his deſerving the eſteem and good-will of all; and this ſuppoſed reciprocation of ſocial feelings is, by the very frame of our nature, made a ſource of very intenſe and enlivening joys. By this ſympathy of affections and intereſts, he feels himſelf intimately united with the human race; and, being ſenſibly *alive* over the whole ſyſtem, his heart receives and becomes reſponſive to every touch given to any part. So that, as an eminent *philoſopher*§ finely expreſſes it, he gathers contentment and delight from the pleaſed and happy ſtates of thoſe around him, from accounts and relations of ſuch happineſs, from the very countenances, geſtures, voices, and ſounds, even of creatures foreign to our kind whoſe ſigns of joy and contentment he can any way diſcern.

§ Vide Shaftſb. Inq. into Virtue, Book II.

215 Do not interfere with other joys.

Nor do thoſe generous affections ſtop any other natural ſource of joy whatever, or deaden his ſenſe of any innocent gratification. They rather keep the ſeveral *ſenſes* and *powers of enjoyment* open and diſengaged, intenſe and uncorrupted by riot or abuſe: as is evident to any one who conſiders the diſſipated, unfeeling ſtate of men of *pleaſure*, *ambition*, or *intereſt*, and compares it with the ſerene and gentle ſtate of a mind at peace with itſelf, and friendly to all mankind, unruffled by any violent emotion, and ſenſible of every good natured and alluring joy.

216 The miſery of exceſs in the private paſſions.

It were eaſy, by going through the different ſets of affections mentioned formerly*, to ſhow, that it is only by maintaining the proportion ſettled there, that the mind arrives at true repoſe and ſatisfaction. If *fear* exceeds that proportion, it ſinks into melancholy and dejects. If *anger* paſſes juſt bounds, it ferments into rage and revenge, or ſubſides into a ſullen corroding gloom, which embitters every good, and renders one exquiſitely ſenſible to every ill. The *private* paſſions, the *love of honour* eſpecially, whoſe impulſes are more generous, as its effects are more diffuſive, are inſtruments of private pleaſure; but if they are diſproportioned to our *wants*, or to the *value* of their ſeveral objects, or to the *balance* of other paſſions equally neceſſary and more amiable, they become inſtruments of intenſe pain and miſery. For, being now deſtitute of that counterpoiſe which held them at a due pitch, they grow turbulent, peeviſh, and revengeful, the cauſe of conſtant reſtleſſneſs and torment, ſometimes flying out into a wild delirious joy, at other times ſettling in a deep ſplenetic grief. The concert between reaſon and paſſion is then broke; all is diſſonance and diſtraction within. The mind is out of frame, and feels an agony proportioned to the violence of the reigning paſſion.

*See part I. chap. i. ii.

217 In the public affections,

The caſe is much the ſame, or rather worſe, when any of the particular *kind* affections are out of their natural order and proportion; as happens in the caſe of *effeminate pity*, *exorbitant love*, *parental dotage*, or any *party-paſſion*, where the juſt regards to ſociety are ſupplanted. The more *ſocial* and *diſintereſted* the paſſion is, it breaks out into the wilder exceſſes, and makes the more dreadful havoc both within and abroad; as is but too apparent in thoſe caſes where a falſe ſpecies of *religion*, *honour*, *zeal*, or *party rage*, has ſeized on the natural enthuſiaſm of the mind, and worked it up to madneſs. It breaks through all ties *natural* and *civil*, diſregards the moſt ſacred and ſolemn obligations, ſilences every other affection whether *public* or *private*, and transforms the moſt gentle natures into the moſt ſavage and inhuman.

From [illegible]

218 Happineſs of well proportioned paſſions.

Whereas, the man who keeps the *balance of affection* even, is eaſy and ſerene in his motions; mild and yet affectionate; uniform and conſiſtent with himſelf; is not liable to diſagreeable colliſions of intereſts and paſſions; gives always place to the moſt friendly and humane affections, and never to diſpoſitions or acts of reſentment, but on high occaſions, when the *ſecurity* of the *private*, or *welfare* of the *public* ſyſtem, or the *great intereſt* of mankind, neceſſarily require a noble indignation; and even then he obſerves a juſt meaſure in wrath: and laſt of all, he proportions every paſſion to the value of the object he affects, or to the importance of the end he purſues.

219 Sum of the argument.

To ſum up this part of the argument, the *honeſt* and *good* man has eminently the advantage af the *knaviſh* and *ſelfiſh* wretch in every reſpect. The pleaſures which the laſt enjoys flow chiefly from external advantages and gratifications; are ſuperficial and tranſitory; daſhed with long intervals of ſatiety, and frequent returns of remorſe and fear; dependent on favourable accidents and conjectures; and ſubjected to the humours of men. But the *good* man is ſatisfied from himſelf? his principal poſſeſſions lie within, and therefore beyond the reach of the caprice of men or fortune; his enjoyments are exquiſite and permanent; accompanied with no inward checks to damp them, and always with ideas of dignity and ſelf approbation: may be taſted at any time, and in any place. The gratifications of *vice* are turbulent and unnatural, generally ariſing from the relief of paſſions in themſelves intolerable, and iſſuing in tormenting reflection: often irritated by diſappointment, always inflamed by enjoyment, and yet ever cloyed with repetition. The pleaſures of *virtue* are calm and natural; flowing from the exerciſe of kind affections, or delightful reflections in conſequence of them; not only agreeable in the proſpect, but in the preſent feeling: they never ſatiate nor loſe their reliſh; nay, rather the admiration of virtue grows ſtronger every day; and not only is the deſire but the enjoyment heightened by every new gratification; and, unlike to moſt others, it is increaſed, not diminiſhed, by ſympathy and communication.—In fine, the ſatiſfactions of *virtue* may be purchaſed without a bribe, and poſſeſſed in the humbleſt as well as the moſt triumphant fortune; they can bear the ſtricteſt review, do not change with circumſtances, nor grow old with time. Force cannot rob nor fraud cheat us of them; and, to crown all, inſtead of abating, they enhance every other pleaſure.

220 External effects of virtue.

But the happy conſequences of *virtue* are ſeen not only in the internal enjoyments it affords a man, but "in the favourable diſpoſition of external cauſes towards him, to which it contributes."

221 On the body.

As virtue gives the ſober poſſeſſion of one's ſelf, and the command of one's paſſions, the conſequence muſt be heart's eaſe, and a fine natural flow of ſpirits, which conduce more than any thing elſe to health and

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long life. Violent paſſions, and the exceſſes they occaſion, gradually impair and wear down the machine. But the calm placid ſtate of a temperate mind, and the healthful exerciſes in which *virtue* engages her faithful votaries, preſerve the natural functions in full vigour and harmony, and exhilarate the ſpirits, which are the chief inſtruments of action.

222 On one's fortune, intereſt, &c. It may by ſome be thought odd to aſſert, that *virtue* is no enemy to a man's *fortune* in the preſent ſtate of things.—But if by *fortune* be meant a moderate or competent ſhare of *wealth*, *power*, or *credit*, not overgrown degrees of them; what ſhould hinder the virtuous man from obtaining that? He cannot cringe or fawn, it is true, but he can be civil and obliging as well as the knave; and ſurely his civility is more alluring, becauſe it has more manlineſs and grace in it than the mean adulation of the other; he cannot cheat or undermine; but he may be cautious, provident, watchful of occaſions, and equally prompt with the rogue in improving them; he ſcorns to proſtitute himſelf as a pander to the paſſions, or as a tool to the vices, of mankind; but he may have as ſound an underſtanding and as good capacities for promoting their real intereſts as the verieſt court-ſlave; and then he is more faithful and true to thoſe who employ him. In the common courſe of buſineſs, he has the ſame chances with the knave of acquiring a fortune, and riſing in the world. He may have equal abilities, equal induſtry, equal attention to buſineſs; and in other reſpects he has greatly the advantage of him. People love better to deal with him; they can truſt him more; they know he will not impoſe on them, nor take advantage of them, and can depend more on his word than on the oath or ſtrongeſt ſecurities of others. Whereas what is commonly called *cunning*, which is the *offspring of ignorance*, and conſtant *companion* of *knavery*, is not only a mean-ſpirited, but a very ſhort-ſighted talent, and a fundamental obſtacle in the road of buſineſs. It may procure indeed immediate and petty gains; but it is attended with dreadful abatements, which do more than overbalance them, both as it ſinks a man's credit when diſcovered, and cramps that largeneſs of mind which extends to the remoteſt as well as the neareſt intereſt, and takes in the moſt durable equally with the moſt tranſient gains. It is therefore eaſy to ſee how much a man's *credit* and *reputation*, and conſequently his ſucceſs, depend on his honeſty and virtue.

223 On one's peace and ſecurity. With regard to *ſecurity* and *peace* with his neighbours, it may be thought, perhaps, that the man of a quiet forgiving temper, and a flowing benevolence and courteſy, is much expoſed to injury and affronts from every proud or peeviſh mortal, who has the power or will to do miſchief. If we ſuppoſe, indeed, the *quietneſs* and *gentleneſs* of nature accompanied with *cowardice* and *puſillanimity*, this may often be the caſe; but in reality the good man is bold as a lion, and ſo much the bolder for being the calmer. Such a perſon will hardly be a butt to mankind. The ill natured will be afraid to provoke him, and the good-natured will not incline to do it. Beſides, *true virtue*, which is conducted by reaſon, and exerted gracefully and without parade, is a moſt inſinuating and commanding thing; if it cannot diſarm malice and reſentment at once, it will wear them out by degrees, and ſubdue them at length. How many have, by favours and prudently yielding, triumphed over an enemy, who would have been inflamed into tenfold rage by the fierceſt oppoſition! In fine *goodneſs* is the moſt univerſally popular thing that can be.

From the Being and Providence of God.

224 On one's family. To conclude; the good man may have ſome enemies, but he will have more friends; and, having given ſo many marks of private friendſhip or public virtue, he can hardly be deſtitute of a patron to protect, or a ſanctuary to entertain him, or to protect or entertain his children when he is gone. Though he ſhould have little elſe to leave them, he bequeaths them the faireſt and generally the moſt unenvied, inheritance of a *good name*, which, like good ſeed ſown in the field of futurity, will often raiſe up unſolicited friends, and yield a benevolent harveſt of unexpected charities. But ſhould the fragrance of the parent's virtue prove offenſive to a perverſe or envious age, or even draw perſecution on the friendleſs orphans, there is *one* in heaven who will be more than a father to them, and recompenſe their parent's virtues by ſhowering down bleſſings on them.

CHAP. III. *Motives to* VIRTUE *from the* BEING *and* PROVIDENCE *of* GOD.

225 Two external motives to virtue. BESIDES the intereſting motive mentioned in the laſt Chapter, there are two great motives to *virtue*, ſtrictly connected with *human life*, and reſulting from the very *conſtitution* of the *human mind*. The firſt is the BEING and PROVIDENCE of GOD: the ſecond is the IMMORTALITY of the SOUL, with *future rewards* and *puniſhments*.

226 Their importance. It appears from Chap. iv. of Part II. that *man*, by the *conſtitution* of his nature, is deſigned to be a RELIGIOUS CREATURE. He is intimately connected with the *Deity*, and neceſſarily dependent on him. From that *connection* and neceſſary *dependence* reſult various *obligations* and *duties*, without fulfilling which, ſome of his ſublime powers and affections would be incomplete and abortive. If he be likewiſe an IMMORTAL creature, and if his *preſent conduct* ſhall affect his *future happineſs* in *another* ſtate as well as in the *preſent*, it is evident that we take only a *partial view* of the *creature* if we leave out this important property of his nature, and make a *partial eſtimate of human life*? if we ſtrike out of the account, or overlook, that part of his duration which runs out into eternity.

227 Piety. It is evident from the above-mentioned Chapter, that "to have a reſpect to the *Deity* in our temper and conduct, to *venerate* and *love* his *character*, to *adore* his *goodneſs*, to *depend upon* and *reſign* ourſelves to his *providence*, to *ſeek* his *approbation*, and *act* under a *ſenſe* of his *authority*, is a *fundamental part* of *moral virtue*, and the *completion* of the *higheſt deſtination* of *our nature*."

228 A ſupport to virtue. But as *piety* is an eſſential part of virtue, ſo likewiſe it is a *great ſupport* and *enforcement* to the practice of it. To contemplate and admire a Being of ſuch tranſcendent dignity and perfection as God, muſt naturally and neceſſarily open and enlarge the mind, give a freedom and ampleneſs to its powers, and a grandeur and elevation to its aims. For, as an excellent *divine* obſerves, "the greatneſs of an object, and the excellency of the act of any AGENT about a tranſcendent object

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object, doth mightily tend to the enlargement and improvement of his faculties." Little objects, mean company, mean cares, and mean buſineſs, cramp the mind, contract its views, and give it a creeping air and deportment. But when it ſoars above mortal cares and mortal purſuits into the regions of divinity, and converſes with the greateſt and beſt of Beings, it ſpreads itſelf into a wider compaſs, takes higher flights in reaſon and goodneſs, becomes godlike in its air and manners. *Virtue* is, if one may ſay ſo, both the *effect* and *cauſe* of largeneſs of mind. It requires that one think freely, and act nobly. Now what can conduce more to freedom of thought and dignity of action, than to conceive worthily of God, to reverence and adore his unrivalled excellency, to imitate and tranſcribe that excellency into our own nature, to remember our relation to him, and that we are the images and repreſentatives of his glory to the reſt of the creation? Such feelings and exerciſes muſt and will make us ſcorn all actions that are baſe, unhandſome, or unworthy our ſtate; and the relation we ſtand in to God will irradiate the mind with the light of wiſdom, and ennoble it with the liberty and dominion of virtue.

229 A guard and enforcement to virtue

The influence and efficacy of *religion* may be conſidered in another light. We all know that the preſence of a friend, a neighbour, or any number of ſpectators, but eſpecially an auguſt aſſembly of them, uſes to be a conſiderable check upon the conduct of one who is not loſt to all ſenſe of honour and ſhame, and contributes to reſtrain many irregular ſallies of paſſion. In the ſame manner as we imagine that the awe of ſome ſuperior mind, who is ſuppoſed privy to our ſecret conduct, and armed with full power to reward or puniſh it, will impoſe a reſtraint on us in ſuch actions as fall not under the controul or animadverſion of others. If we go ſtill higher, and ſuppoſe our inmoſt thoughts and darkeſt deſigns, as well as our moſt ſecret actions, to lie open to the notice of the ſupreme and univerſal mind, who is both the *ſpectator* and *judge* of human actions, it is evident that the belief of ſo auguſt a preſence, and ſuch awful inſpection muſt carry a reſtraint and weight with it proportioned to the ſtrength of that belief, and be an additional motive to the practice of many duties which would not have been performed without it.

230 Exerciſes of piety improving to virtue.

It may be obſerved farther, that "to live under an habitual ſenſe of the *Deity* and his great *adminiſtration*, is to be converſant with *wiſdom*, *order*, and *beauty*, in the higheſt ſubjects, and to receive the delightful reflections and benign feelings which theſe excite while they irradiate upon him from every ſcene of nature and providence." How improving muſt ſuch views be to the mind, in dilating and exalting it above thoſe puny intereſts and competitions which agitate and inflame the bulk of mankind againſt each other!

Chap. IV. *Motive to* Virtue *from the* Immortality *of the* Soul, &c.

231 Metaphyſical arguments for its immortality.

The other motive mentioned was the *immortality* of the ſoul, with *future rewards* and *puniſhments*. The *metaphyſical* proofs of the ſoul's immortality are commonly drawn from—its *ſimple uncompounded*, and *indiviſible* nature; from whence it is concluded, that it cannot be corrupted or extinguiſhed by a diſſolution or deſtruction of its parts:—from its having a *beginning of motion* within itſelf; whence it is inferred, that it cannot diſcontinue and loſe its motion:—from the different properties of *matter* and *mind*, the *ſluggiſhneſs* and *inactivity of one*, and the immenſe *activity* of the *other*; its prodigious flight of *thought* and *imagination*; its *penetration*, *memory*, *foreſight*, and *anticipations* of *futurity*: from whence it is concluded, that a being of ſo divine a nature cannot be extinguiſhed. But as theſe metaphyſical proofs depend on intricate reaſonings concerning the *nature*, *properties*, and *diſtinctions* of *body* and *mind*, with which we are not very well acquainted, they are not obvious to ordinary underſtandings, and are ſeldom ſo convincing even to thoſe of higher reach, as not to leave ſome doubts behind them. Therefore perhaps it is not ſo ſafe to reſt the proof of ſuch an important article on what many may call the ſubtilties of ſchool-learning. Thoſe proofs which are brought from *analogy*, from the *moral conſtitution* and *phænomena* of the *human mind*, the *moral attributes* of God, and the *preſent courſe of things*, and which therefore are called the *moral* arguments, are the plaineſt, and generally the moſt ſatisfying. We ſhall ſelect only one or two from the reſt.

232 Moral proof from analogy.

In tracing the *nature* and *deſtination* of any being, we form the ſureſt judgment from his *powers of action*, and the ſcope and *limits* of theſe, compared with his *ſtate*, or with that *field* in which they are exerciſed. If this being paſſes through different ſtates, or fields of action, and we find a *ſucceſſion* of powers adapted to the different periods of his progreſs, we conclude that he was deſtined for thoſe ſucceſſive ſtates, and reckon his nature *progreſſive*. If, beſides the immediate ſet of powers which fit him for action in his preſent ſtate, we obſerve another ſet which appear ſuperfluous if he were to be confined to it, and which point to another or higher one, we naturally conclude, that he is not deſigned to remain in his preſent ſtate, but to advance to that for which thoſe ſupernumerary powers are adapted. Thus we argue, that the *inſect*, which has wings forming or formed, and all the apparatus proper for flight, is not deſtined always to creep on the ground, or to continue in the torpid ſtate of adhering to a wall, but is deſigned in its ſeaſon to take its flight in air. Without this farther deſtination, the admirable mechaniſm of wings and the other apparatus would be uſeleſs and abſurd. The ſame kind of reaſoning may be applied to man, while he lives only a ſort of *vegetative* life in the womb. He is furniſhed even there with a beautiful apparatus of organs, eyes, ears, and other delicate ſenſes, which receive nouriſhment indeed, but are in a manner folded up, and have no proper exerciſe or uſe in their preſent confinement *. Let us ſuppoſe ſome intelligent ſpectator, who never had any connection with man, nor the leaſt acquaintance with human affairs, to ſee this odd phenomenon, a creature formed after ſuch a manner, and placed in a ſituation apparently unſuitable to ſuch various machinery: muſt he not be ſtrangely puzzled about the uſe of this complicated ſtructure, and reckon ſuch a profuſion of art and admirable workmanſhip loſt on the ſubject; or reaſon by way of anticipation, that a creature endued with ſuch various yet unexerted capacities, was deſtined for a more enlarged

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* Vide Ludov. Viv. de Relig. Chriſt. Lib. II. de Vita Uteri, &c.

[illegible] to Nature.

ſphere of action, in which theſe latent capacities ſhall have full play? The vaſt variety and yet beautiful ſymmetry and proportions of the ſeveral parts and organs with which the creature is endued, and their apt coheſion with and dependence on the curious receptacle of their life and nouriſhment, would forbid his concluding the whole to be the birth of chance, or the bungling effort of an unſkilful artiſt; at leaſt would make him demur a while at ſo harſh a ſentence. But if, while he is in this ſtate of uncertainty, we ſuppoſe him to ſee the babe, after a few ſucceſsful ſtruggles, throwing off his fetters, breaking looſe from his little dark priſon, and emerging into open day, then unfolding his recluſe and dormant powers, breathing in air, gazing at light, admiring colours, ſounds, and all the *fair variety* of nature; immediately his doubts clear up, the propriety and excellency of the workmanſhip dawn upon him with full luſtre, and the whole myſtery of the firſt period is unravelled by the opening of this new ſcene. Though in this *ſecond* period the creature lives chiefly a kind of *animal*-life, i. e. of *ſenſe* and *appetite*, yet by various trials and obſervations he gains experience, and by the gradual evolution of the powers of *imagination* he ripens apace for an *higher* life, for exerciſing the arts of *deſign* and *imitation*, and of thoſe in which ſtrength or dexterity are more requiſite than acuteneſs or reach of judgment. In the ſucceeding *rational* or *intellectual* period, his *underſtanding*, which formerly crept in a lower, mounts into an higher ſphere, canvaſſes the natures, judges of the relations of things, forms ſchemes, deduces conſequences from what is paſt, and from preſent as well as paſt collects future events. By this ſucceſſion of ſtates, and of correſpondent culture, he grows up at length into a *moral*, a *ſocial*, and a *political* creature. This is the laſt period at which we perceive him to arrive in this his mortal career. Each *period* is introductory to the next ſucceeding one; each *life* is a field of exerciſe and improvement for the next higher one; the life of the *fœtus* for that of the *infant*, the life of the *infant* for that of the *child*, and all the lower for the higheſt and beſt*.—But is this the laſt period of nature's progreſſion? Is this the utmoſt extent of her plot, where ſhe winds up the drama, and diſmiſſes the actor into eternal oblivion? Or does he appear to be inveſted with ſupernumerary powers, which have not full exerciſe and ſcope even in the laſt ſcene, and reach not that maturity or perfection of which they are capable; and therefore point to ſome higher ſcene where he is to ſuſtain another and more important character than he has yet ſuſtained? If any ſuch there are, may we not conclude by analogy, or in the ſame way of anticipation as before, that he is deſtined for that after part, and is to be produced upon a more auguſt and ſolemn ſtage, where his ſublimer powers ſhall have proportioned action, and his nature attain its completion?

233 Powers in man which point to an after life.

234 Intellectual.

If we attend to that *curioſity*, or prodigious *thirſt* of *knowledge*, which is natural to the mind in every period of its progreſs, and conſider withal the endleſs round of buſineſs and care, and the various hardſhips to which the bulk of mankind are chained down; it is evident, that in this preſent ſtate it is impoſſible to expect the gratification of an appetite at once ſo inſatiable and ſo noble. Our *ſenſes*, the ordinary organs by which knowledge is let into the mind, are always imperfect, and often fallacious; the advantages of aiding or correcting them are poſſeſſed by few; the difficulties of finding out truth amidſt the various and contradictory opinions, intereſts, and paſſions of mankind, are many; and the wants of the creature, and of thoſe with whom he is connected, numerous and urgent: ſo that it may be ſaid of moſt men, that their *intellectual* organs are as much ſhut up and ſecluded from proper nouriſhment and exerciſe in that little circle to which they are confined, as the bodily organs are in the womb. Nay, thoſe who to an aſpiring genius have added all the aſſiſtances of art, leiſure, and the moſt liberal education, what narrow proſpects can even they take of this unbounded ſcene of things from that little eminence on which they ſtand? and how eagerly do they ſtill graſp at new diſcoveries, without any ſatisfaction or limit to their ambition?

From the Immortality of the Soul.

235 Moral powers.

But ſhould it be ſaid, that man is made for *action* and not for *ſpeculation*, or fruitleſs ſearches after knowledge, we aſk, For what kind of action? Is it only for bodily exerciſes, or for *moral*, *political*, and *religious* ones? Of all theſe he is capable; yet, by the unavoidable circumſtances of his lot, he is tied down to the *former*, and has hardly any leiſure to think of the *latter*, or if he has, wants the proper inſtruments of exerting them. The *love of virtue*, *of one's friends* and *country*, the *generous ſympathy with mankind*, and *heroic zeal of doing good*, which are all ſo *natural* to great and good minds, and ſome traces of which are found in the loweſt, are ſeldom united with proportioned means or opportunities of exerciſing them: ſo that the *moral* ſpring, the noble energies and impulſes of the mind, can hardly find proper ſcope even in the moſt fortunate condition; but are much depreſſed in ſome and almoſt entirely reſtrained in the generality, by the numerous clogs of an indigent, ſickly, or embarraſſed life. Were ſuch mighty powers, ſuch god-like affections, planted in the human breaſt to be folded up in the narrow womb of our preſent exiſtence, never to be produced into a more *perfect* life, nor to expatiate in the ample career of immortality?

236 Unſatisfied deſires of exiſtence and happineſs.

Let it be conſidered, at the ſame time, that no poſſeſſion, no enjoyment, within the round of mortal things, is commenſurate to the deſires, or adequate to the capacities, of the mind. The moſt exalted condition has its abatements; the happieſt conjuncture of fortune leaves many wiſhes behind; and, after the higheſt gratifications, the mind is carried forward in purſuit of new ones without end. Add to all, the fond *deſire* of *immortality*, the ſecret *dread* of *non-exiſtence*, and the high unremitting *pulſe* of the ſoul beating for *perfection*, joined to the improbability or the impoſſibility of attaining it *here;* and then judge whether this elaborate ſtructure, this magnificent apparatus of inward powers and organs, does not plainly point out an *hereafter, and intimate eternity to man?* Does nature give the finiſhing touches to the leſſer and ignobler inſtances of her ſkill, and raiſe every other creature to the maturity and perfection of his being; and ſhall ſhe leave her principal workmanſhip unfiniſhed? Does ſhe carry the *vegetative* and *animal* life in *man* to their full vigour and higheſt deſtination; and ſhall ſhe ſuffer his *intellectual*, his *moral*, his *divine* life to otives to Virtue

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* See Butler's Analogy, Part I.

to fade away, and be for ever extinguiſhed? Would ſuch abortions in the *moral* world be congruous to that *perfection of wiſdom and goodneſs* which upholds and adorns the *natural?*

237
herefore
an is im-
ortal.

We muſt therefore conclude from this detail, that the *preſent ſtate*, even at its beſt, is only the WOMB of man's being, in which the nobleſt principles of his nature are in a manner fettered, or ſecluded from a correſpondent ſphere of action; and therefore deſtined for a future and unbounded ſtate, where they ſhall emancipate themſelves, and exert the fulneſs of their ſtrength. The moſt accompliſhed mortal, in this low and dark apartment of nature, is only the *rudiments* of what he ſhall be when he takes his ethereal flight, and puts on immortality. Without a reference to that ſtate, *man* were a mere abortion, a rude unfiniſhed embryo, a monſter in nature. But this being once ſuppoſed, he ſtill maintains his rank of the maſterpiece of the creation; his latent powers are all ſuitable to the *harmony* and *progreſſion* of nature; his noble aſpirations, and the pains of his diſſolution, are his efforts towards a *ſecond* birth, the pangs of his delivery into light, liberty, and perfection; and *death*, his diſcharge from gaol, his ſeparation from his fellow-priſoners, and introduction into the aſſembly of thoſe heroic ſpirits who are gone before him, and of their great eternal Parent. The fetters of his mortal coil being looſened, and his priſon walls broke down, he will be bare and open on every ſide to the admiſſion of *truth* and *virtue*, and their fair attendant *happineſs;* every *vital* and *intellectual* ſpring will evolve itſelf with a divine elaſticity in the free air of heaven. He will not then peep at the univerſe and its glorious Author through a dark grate or a groſs medium, nor receive the reflections of his glory through the ſtrait openings of ſenſible organs; but will be *all eye, all ear, all ethereal and divine feeling**. Let one part, however, of the analogy be attended to: That as in the womb we receive our original conſtitution, form, and the eſſential *ſtamina* of our being, which we carry along with us into the light, and which greatly affect the ſucceeding periods of our life; ſo our temper and condition in the *future* life will depend on the conduct we have obſerved, and the character we have formed, in the *preſent* life. We are *here* in *miniature* what we ſhall be at *full length hereafter*. The firſt *rude ſketch* or *out-lines* of *reaſon* and *virtue* muſt be drawn at preſent, to be afterwards enlarged to the *ſtature* and *beauty* of angels.

* Vide Region of
ature, § 9.

238
nmorta-
ty a guard
ad incen-
ve to vir-
te.

This, if duly attended to, muſt prove not only a *guard*, but an admirable *incentive* to virtue. For he who faithfully and ardently follows the light of knowledge, and pants after higher improvements in virtue, will be wonderfully animated and inflamed in that purſuit by a full conviction that the ſcene does not cloſe with life—that his ſtruggles, ariſing from the weakneſs of nature and the ſtrength of habit, will be turned into triumphs—that his career in the tract of wiſdom and goodneſs will be both ſwifter and ſmoother—and thoſe generous ardours with which he glows towards *heaven*, i. e. the *perfection* and *immortality of virtue*, will find their adequate object and exerciſe in a ſphere proportionably enlarged, incorruptible, immortal. On the other hand, what an inexpreſſible damp muſt it be to the good man, to dread the total extinction of that *light* and *virtue*, without which *life*, nay, *immortality* itſelf, were not worth a ſingle wiſh?

From the Immortality of the Soul.

239
Proof from the inequality of preſent diſtributions.

Many writers draw their proofs of the immortality of the ſoul, and of a future ſtate of rewards and puniſhments, from the unequal diſtribution of theſe here. It cannot be diſſembled that wicked men often eſcape the *outward* puniſhment due to their crimes, and do not feel the *inward* in that meaſure their demerit ſeems to require, partly from the callouſneſs induced upon their nature by the habits of vice, and partly from the diſſipation of their minds abroad by pleaſure or buſineſs—and ſometimes good men do not reap all the natural and genuine fruits of their virtue, through the many unforeſeen or unavoidable calamities in which they are involved. To the ſmalleſt reflection, however, it is obvious, that the natural tendency of virtue is to produce happineſs; that if it were univerſally practiſed, it would, in fact, produce the greateſt ſum of happineſs of which human nature is capable; and that this tendency is defeated only by numerous individuals, who, forſaking the laws of virtue, injure and oppreſs thoſe who ſteadily adhere to them. But the natural tendency of virtue is the reſult of that conſtitution of things which was eſtabliſhed by God at the creation of the world. This being the caſe, we muſt either conclude, that there will be a future ſtate, in which all the moral obliquities of the preſent ſhall be made ſtraight; or elſe admit, that the deſigns of infinite wiſdom, goodneſs, and power, can be finally defeated by the perverſe conduct of human weakneſs.—But this laſt ſuppoſition is ſo extravagantly abſurd, that the reality of a future ſtate, the only other poſſible alternative, may be pronounced to have the evidence of perfect demonſtration.

240
Belief of immortality, &c. a great ſupport amidſt trials.

Virtue has preſent rewards, and *vice* preſent puniſhments annexed to it; ſuch rewards and puniſhments as make *virtue*, in moſt caſes that happen, far more eligible than *vice:* but, in the infinite variety of human contingencies, it may ſometimes fall out, that the inflexible practice of virtue ſhall deprive a man of conſiderable advantages to himſelf, his family, or friends, which he might gain by a well-timed piece of roguery; ſuppoſe by betraying his truſt, voting againſt his conſcience, ſelling his country, or any other crime where the ſecurity againſt diſcovery ſhall heighten the temptation. Or, it may happen, that a ſtrict adherence to his honour, to his religion, to the cauſe of liberty and virtue, ſhall expoſe him, or his family, to the loſs of every thing, nay, to poverty, ſlavery, death itſelf, or to torments far more intolerable. Now what ſhall ſecure a man's virtue in circumſtances of ſuch trial? What ſhall enforce the obligations of conſcience againſt the allurements of ſo many intereſts, the dread of ſo many and ſo terrible evils, and the almoſt unſurmountable averſion of human nature to exceſſive pain! The conflict is the greater, when the circumſtances of the crime are ſuch as eaſily admit a variety of alleviations from *neceſſity, natural affection, love to one's family* or *friends*, perhaps in indigence: theſe will give it even the air of virtue. Add to all, that the crime may be thought to have few bad conſequences,—may be eaſily concealed,—or imagined poſſible to be retrieved in a good meaſure by future good conduct. It is obvious to which ſide moſt men will lean in ſuch a caſe; and how much need there is of a balance in the

Motives to Virtue.

the oppoſite ſcale, from the conſideration of a *God*, of a *Providence*, and of an *immortal ſtate of retribution*, to keep the mind firm and uncorrupt in thoſe or like inſtances of ſingular trial or diſtreſs.

241 In the general courſe of life.

But without ſuppoſing ſuch peculiar inſtances, a ſenſe of a governing Mind, and a perſuaſion that virtue is not only befriended by him here, but will be crowned by him hereafter with rewards ſuitable to its nature, vaſt in themſelves, and immortal in their duration, muſt be not only a mighty ſupport and incentive to the practice of virtue, but a ſtrong barrier againſt vice. The thoughts of an Almighty Judge, and of an impartial future reckoning, are often alarming, inexpreſſibly ſo, even to the ſtouteſt offenders. On the other hand, how ſupporting muſt it be to the good man, to think that he acts under the eye of his friend, as well as judge! How improving, to conſider the *preſent ſtate* as connected with a *future* one, and every relation in which he ſtands as a *ſchool* of *diſcipline* for his *affections*; every *trial* as the *exerciſe* of ſome *virtue;* and the virtuous deeds which reſult from both, as introductory to higher ſcenes of *action* and *enjoyment!* Finally, how tranſporting is it to view *death* as his *diſcharge* from the *warfare* of *mortality*, and a triumphant *entry* into a ſtate of the freedom, ſecurity, and perfection, in which knowledge and wiſdom ſhall break upon him from every quarter; where each faculty ſhall have its proper object; and his virtue, which was often damped or defeated here, ſhall be enthroned in undiſturbed and eternal empire!

On reviewing this ſhort *ſyſtem* of *morals*, and the *motives* which ſupport and enforce it, and comparing both with the CHRISTIAN *ſcheme*, what *light* and *vigour* do they borrow from thence! How clearly and fully does CHRISTIANITY lay open the *connections* of our nature, both *material* and *immaterial*, and *future* as well as *preſent!* What an ample and beautiful detail does it preſent of the *duties* we owe to *God*, to *ſociety*, and *ourſelves*, promulgated in the moſt ſimple, intelligible, and popular manner; diveſted of every partiality of ſect or nation; and adapted to the general ſtate of mankind! With what bright and alluring *examples* does it illuſtrate and recommend the practice of thoſe duties; and with what mighty *ſanctions* does it enforce that practice! How ſtrongly does it deſcribe the *corruptions* of our nature; the *deviations* of our life from the *rule* of *duty*, and the *cauſes* of both! How marvellous and benevolent a plan of *redemption* does it unfold, by which thoſe corruptions may be remedied, and our *nature* reſtored from its *deviations* to tranſcendent heights of *virtue* and *piety!* Finally, what a fair and comprehenſive proſpect does it give us of the *adminiſtration* of *God*, of which it repreſents the *preſent ſtate* only as a *ſmall period*, and a *period* of *warfare* and *trial!* How ſolemn and unbounded are the ſcenes which it opens beyond it! the *reſurrection* of the *dead*, and *general judgment*, the *equal diſtribution* of *rewards* and *puniſhments* to the *good* and the *bad;* and the full *completion* of *divine wiſdom* and *goodneſs* in the *final eſtabliſhment* of *order*, *perfection*, and *happineſs!* How glorious then is that SCHEME of RELIGION, and how worthy of *affection* as well as of *admiration*, which, by making ſuch *diſcoveries*, and affording ſuch *aſſiſtances*, has diſcloſed the unfading fruits and triumphs of VIRTUE, and ſecured its intereſts beyond the power of TIME and CHANCE.

From Immorty of Soul.

242 Advantages of Chriſtian ſcheme, and its connection with natural religion or morality.

Moral ‖ Moraut.

MORAL Senſe, that whereby we perceive what is good, virtuous, and beautiful, in actions, manners, and characters. See *MORAL Philoſophy*.

MORALITY. See *MORAL Philoſophy*.

MORANT (Philip), a learned and indefatigable antiquary and biographer, ſon of Stephen Morant, was born at St Saviour's in the iſle of Jerſey, October 6, 1700: and, after finiſhing his education at Abingdon ſchool, was entered December 16th, 1717 at Pembroke college Oxford, where he took the degree of B. A. June 10th, 1721, and continued till midſummer 1722; when he was preferred to the office of preacher of the Engliſh church at Amſterdam, but never went to take poſſeſſion. He took the degree of M. A. in 1724, and was preſented to the rectory of Shellow Bowels, April 20th 1733; to the vicarage of Bromfield, January 17th 1733-4; to the rectory of Chicknal Smeley, September 19th, 1735; to that of St Mary's, Colcheſter, March 9th, 1737; to that of Wickham Biſhop's, January 21ſt, 1742-3; and to that of Aldham, September 14th, 1745. All theſe benefices are in the county of Eſſex. In 1748 he publiſhed his Hiſtory of Colcheſter, of which only 200 copies were printed. In 1751 he was elected F. S. A; and in February 1768 he was appointed by the lords ſub-committees of the houſe of peers to ſucceed Mr Blyke in preparing for the preſs a copy of the rolls of parliament; a ſervice to which he diligently attended till his death, which happened November 25th, 1770. Beſides the above work, and many uſeful tranſlations, abridgements, and compilations, &c. he wrote, all the Lives in the *Biographia Britannica* marked C; alſo the life of Stillingfleet, which has no mark at the end: The Hiſtory of Eſſex, 1760, 1768, 2 vols folio: The life of King Edward the Confeſſor, and about 150 ſermons. He prepared the rolls of parliament as far as the 16th of Henry IV. The continuation of the taſk devolved upon Thomas Aſtle, Eſq; who had married his only daughter.

Morar ‖ Mora

MORANT-Point, the moſt eaſterly point or promontory of the iſland of Jamaica, in America. W. Lon. 75. 56. N. Lat. 17. 56.

MORASS, a marſh, fen, or low moiſt ground, which receives the waters from above without having any deſcent to carry them off again. Somner derives the word from the Saxon *merſe*, "lake;" Salmaſius from *mare*, "a collection of waters;" others from the German *maraſt*, "a muddy place;" and others from *Mareſc*, of *maricetum*, *à mariſcis*, i. e. ruſhes. See BOG, FEN, and DRAINING.

In Scotland, Ireland, and the north of England, they have a peculiar kind of moraſſes called *moſſes* or *peat-moſſes*, whence the country people dig their peat or turf for firing. See MOSS.

MORAT, or MURTEN, a rich trading, and conſider

Morat, Morata.

ſiderable town of Swiſſerland, capital of a bailiwick of the ſame name, belonging to the cantons of Bern and Friberg, with a caſtle where the bailiff reſides. It is ſeated on the lake Morat, on the road from Avenche to Bern, 10 miles weſt of Bern and 10 miles north-eaſt of Friburg. The lake is about ſix miles long and two broad, the country about it being pleaſant and well cultivated. The lakes of Morat and Neufchatel are parallel to each other, but the latter is more elevated, diſcharging itſelf by means of the river Broye into the lake of Neufchatel. According to M. de Luc, the former is 15 French feet above the level of Neufchatel lake; and both theſe lakes, as well as that of Bienne, ſeem formerly to have extended conſiderably beyond their preſent limits, and from the poſition of the country appear to have been once united. Formerly the large fiſh named *ſilurus glanis*, or the ſaluth, frequented theſe lakes, but has not been caught in them for a long time paſt. The environs of this town and lake were carefully examined by Mr Coxe during his reſidence in Switzerland, who made ſeveral excurſions acroſs the lake to a ridge of hills ſituated betwixt it and Neufchatel. Here are many delightful proſpects; particularly one from the top of mount Vuilly, which, he ſays, is perhaps the only central ſpot from which the eye can at once comprehend the vaſt amphitheatre formed on one ſide by the Jura ſtretching from the environs of Geneva as far as Baſle, and, on the other, by that ſtupendous chain of ſnowy Alps which extend from the frontiers of Italy to the confines of Germany, and is loſt at each extremity in the horizon. Morat is celebrated for the obſtinate defence it made againſt Charles the Bold, duke of Burgundy, and for the battle which afterwards followed on the 22d of June 1476, where the duke was defeated, and his army almoſt entirely deſtroyed *. Not far from the town, and adjoining to the high road, there ſtill remains a monument of this victory. It is a ſquare building, filled with the bones of Burgundian ſoldiers, who were ſlain at the ſiege and in the battle; the number of which appears to have been very conſiderable. There are ſeveral inſcriptions in the Latin and German languages commemorating the victory.

MORATA (Olympia Fulvia), an Italian lady, diſtinguiſhed for her learning, was born at Ferrara, in 1526. Her father, after teaching the belles lettres in ſeveral cities of Italy, was made preceptor to the two young princes of Ferrara, the ſons of Alphonſus I. The uncommon abilities he diſcovered in his daughter determined him to give her a very extraordinary education. Meanwhile the princeſs of Ferrara ſtudying polite literature, it was judged expedient that ſhe ſhould have a companion in the ſame purſuit; and Morata being called, ſhe was heard by the aſtoniſhed courtiers to declaim in Latin, to ſpeak Greek, and to explain the paradoxes of Cicero. Her father dying, ſhe was obliged to return home to take upon her the management of family-affairs, and the education of her brother and three ſiſters; both which ſhe executed with the greateſt diligence and ſucceſs. In the mean time Andrew Grunthler, a young German, who had ſtudied phyſic, and taken his doctor's degree at Ferrara, fell in love with her, and married her. She now went with her huſband to Germany, taking her little brother with her, whom ſhe inſtructed in the Latin and Greek tongues: and after ſtaying a ſhort time at Augſburg, went to Schweinfort in Franconia, where her huſband was born: but they had not been there long before that town was unhappily beſieged and burnt; however, eſcaping the flames, they fled in the utmoſt diſtreſs to Hamelbur. This place they were alſo obliged to quit, and were reduced to the laſt extremities, when the elector palatine invited Grunthler to be profeſſor of phyſic at Heidelberg, and he entered on his new office in 1544; but they no ſooner began to taſte the ſweets of repoſe, than a diſeaſe, occaſioned by the diſtreſſes and hardſhips they had ſuffered, ſeized upon Morata, who died in 1555, in the 29th year of her age; and her huſband and brother did not long ſurvive her. She compoſed ſeveral works, great part of which were burnt with the town of Schweinfort; the remainder, which conſiſt of orations, dialogues, letters, and tranſlations, were collected and publiſhed under the title of *Olympiæ Fulviæ Moratæ, fœminæ doctiſſimæ, et plane divinæ, opera omnia quæ hactenus inveniri potuerint; quibus Cælii Secundi Curionis epiſtolæ ac orationes acceſſerunt*; which has had ſeveral editions in octavo.

Moravia.

MORAVIA, a river of Turky in Europe, which riſes in Bulgaria, runs north through Servia by Niſſa, and falls into the Danube at Semendria, to the eaſtward of Belgrade.

MORAVIA, a marquiſate of Germany, derives the name of *Mahern*, as it is called by the Germans, and of *Morawa*, as it is called by the natives, from the river of that name which riſes in the mountains of the county of Glatz, and paſſes through the middle of it. It is bounded to the ſouth by Auſtria, to the north by Glatz and Sileſia, to the weſt by Bohemia, and to the eaſt by Sileſia and Hungary; being about 120 miles in length and 100 in breadth.

A great part of this country is over-run with woods and mountains, where the air is very cold, but much wholeſomer than in the low grounds which are full of bogs and lakes. The mountains, in general, are barren; but the more champaign parts tolerably fertile, yielding corn, with plenty of hemp and flax, good ſaffron and paſture. Nor is it altogether deſtitute of wine, red and white, fruits and garden-ſtuff. Moravia alſo abounds in horſes, black cattle, ſheep, and goats. In the woods and about the lakes there is plenty of wild fowl, game, veniſon, bees, honey, hares, foxes, wolves, beavers, &c. In this country are likewiſe quarries of marble, baſtard diamonds, amethyſts, alum, iron, ſulphur, ſalt-petre, and vitriol, with wholeſome mineral-waters, and warm ſprings; but ſalt is imported. Its rivers, of which the March, Morawa, or Morau, are the chief, abound with trout, crayfiſh, barbels, eels, perch, and many other ſorts of fiſh.

The language of the inhabitants is a dialect of the Sclavonic, differing little from the Bohemian; but the nobility and citizens ſpeak German and French.

Moravia was anciently inhabited by the Quadi, who were driven out by the Sclavi. Its kings, who were once powerful and independent, afterwards became dependent on, and tributary to, the German emperors and kings. At laſt, in the year 908, the Moravian kingdom was parcelled out among the Germans, Poles, and Hungarians. In 1086, that part of it properly called *Moravia* was declared a marquiſate by the German king Henry IV. and united with Bohemia, to whoſe dukes and kings it hath ever ſince been ſubject. Though it is not very populous, it contains about 42 greater or walled towns, 17 ſmaller or open towns, and 198 market towns, beſides villages, &c. The ſtates of the country conſiſt of the clergy, lords, knights, and burgeſſes; and the diets, when ſummoned by the regency, are held at Brun. The marquiſate is ſtill governed by its own peculiar conſtitutions, under the *directorium in publicis & cameralibus*, and the ſupreme judicatory at Vienna. It is divided into ſix circles, each of which has its captain, and contributes to its ſovereign about one-third of what is exacted of Bohemia. Towards the expences of the military eſtabliſhment of the whole Auſtrian hereditary countries, its yearly quota is 1,856,490 florins. Seven regiments of foot, one of cuiraſſiers, and one of dragoons, are uſually quartered in it.

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* See Hiſtory of France.

Chriſtianity was planted in this country in the 9th century; and the inhabitants continued attached to the church of Rome till the 15th, when they eſpouſed the doctrine of John Huſs, and threw off Popery: but after the defeat of the elector Palatine, whom they had choſen king, as well as the Bohemians, the emperor Ferdinand II. eſtabliſhed popery; though there are ſtill ſome Proteſtants in Moravia. The biſhop of Olmutz, who ſtands immediately under the pope, is at the head of the eccleſiaſtics in this country. The ſupreme eccleſiaſtical juriſdiction, under the biſhop, is veſted in a conſiſtory.

The commerce of this country is inconſiderable. Of what they have, Brunn enjoys the principal part. At Iglau and Trebitx are manufactures of cloth, paper, gun-powder, &c. There are alſo ſome iron-works and glaſs-houſes in the country.

The inhabitants of Moravia in general are openhearted, not eaſy to be provoked or pacified, obedient to their maſters and true to their promiſes; but credulous of old prophecies, and much addicted to drinking, though neither ſuch ſots or bigots as they are repreſented by ſome geographers. The boors, indeed, upon the river Hank, are ſaid to be a thieviſh, unpoliſhed, brutal race. The ſciences now begin to lift up their heads a little among the Moravians, the univerſity of Olmutz having been put on a better footing; and a riding academy, with a learned ſociety, have been lately eſtabliſhed there.

MORAVIAN BRETHREN. See HERNHUTTERS, and UNITAS *Fratrum*.

MORAW, or MORAVA, a large river of Germany, which has its ſource on the confines of Bohemia and Sileſia. It croſſes all Moravia, where it waters Olmutz and Hradiſch, and receiving the Taya from the confines of Lower Hungary and Upper Auſtria, ſeparates theſe two countries as far as the Danube, into which it falls.

MORBID, among phyſicians, ſignifies "diſeaſed or corrupt;" a term applied either to an unſound conſtitution, or to thoſe parts or humours that are affected by a diſeaſe.

MORBUS COMITIALIS, a name given to the epilepſy; becauſe if on any day when the people were aſſembled in *comitia* upon public buſineſs, any perſon ſuddenly ſeized with this diſorder ſhould fall down, the aſſembly was diſſolved, and the buſineſs of the *comitia*, however important, was ſuſpended. See COMITIA.

MORBUS Regius, the ſame with the JAUNDICE. See MEDICINE *Index*.

MORBUS, or *Diſeaſe*, in botany. See VARIETAS.

MORDAUNT (Charles), earl of Peterborough, a celebrated commander both by ſea and land, was the ſon of John Lord Mordaunt viſcount Avalon, and was born about the year 1658. In 1675 he ſucceeded his father in his honours and eſtate. While young he ſerved under the admirals Torrington and Narborough in the Mediterranean againſt the Algerines; and in 1680 embarked for Africa with the earl of Plymouth, and diſtinguiſhed himſelf at Tangier when it was beſieged by the Moors. In the reign of James II. he voted againſt the repeal of the teſt act; and diſliking the meaſures of the court, obtained leave to go to Holland to accept the command of a Dutch ſquadron in the Weſt Indies. He afterwards accompanied the prince of Orange into England; and upon his advancement to the throne, was ſworn of the privy-council, made one of the lords of the bedchamber to his majeſty, alſo firſt commiſſioner of the treaſury, and advanced to the dignity of earl of Monmouth. But in November 1690 he was diſmiſſed from his poſt in the treaſury. On the death of his uncle Henry earl of Peterborough in 1697, he ſucceeded to that title; and, upon the acceſſion of Queen Anne, was inveſted with the commiſſion of captain-general and governor of Jamaica. In 1705 he was ſworn of the privy-council; and the ſame year declared general and commander in chief of the forces ſent to Spain, and joint admiral of the fleet with Sir Cloudſley Shovel, of which the year following he had the ſole command. His taking Barcelona with a handful of men, and afterwards relieving it when greatly diſtreſſed by the enemy; his driving out of Spain the duke of Anjou, and the French army, which conſiſted of 25,000 men, though his own troops never amounted to 10,000; his gaining poſſeſſion of Catalonia, of the kingdoms of Valencia, Arragon, and the iſle of Majorca, with part of Murcia and Caſtile, and thereby giving the earl of Galway an opportunity of advancing to Madrid without a blow; are aſtoniſhing inſtances of his bravery and conduct. For theſe important ſervices his Lordſhip was declared general in Spain by Charles III. afterwards emperor of Germany; and on his return to England he received the thanks of the Houſe of Lords. His Lordſhip was afterwards employed in ſeveral embaſſies to foreign courts, inſtalled knight of the garter, and made governor of Minorca. In the reign of George I. he was general of all the marine forces in Great Britain, in which poſt he was continued by King George II. He died in his paſſage to Liſbon, where he was going for the recovery of his health, in 1735.—His Lordſhip was diſtinguiſhed by his poſſeſſing various ſhining qualities: for, to the greateſt perſonal courage and reſolution, he added all the arts and addreſs of a general; a lively and penetrating genius; and a great extent of knowledge upon almoſt every ſubject of importance within the compaſs of ancient and moderate literature; hence his familiar letters, inſerted among thoſe of his friend Mr Pope, are an ornament to that excellent collection.

Plate CCCXV.

MOREDELLA, in zoology, a genus of inſects of the coleoptera order. The antennæ are thread-ſhaped and ſerrated; the head is deflected under the neck; the pappi are clavated, compreſſed, and obliquely blunted; and the elytra are bent backwards near the apex. There are ſix ſpecies, all natives of different parts of Europe.

MORE (Sir Thomas), lord high chancellor of England, the ſon of Sir John More, knight, one of the judges of the King's-bench, was born in the year 1480, in Milk-ſtreet, London. He was firſt ſent to a ſchool at St Anthony's in Thread-needle ſtreet; and afterwards introduced into the family of cardinal Moreton who in 1497 ſent him to Canterbury college in Oxford. During his reſidence at the univerſity he conſtantly attended the lectures of Linacre and Grocinus, on the Greek and Latin languages. Having in the ſpace of about two years made conſiderable proficiency in academical learning, he came to New inn in London, in order to ſtudy the law; whence, after ſome time, he removed to Lincoln's-inn, of which his father was a member. Notwithſtanding his application to the law, however being now about 20 years old, he was ſo bigotted to monkiſh diſcipline, that he wore a hair-ſhirt next his ſkin, frequently faſted, and often ſlept on a bare plank. In the year 1503, being then a burgeſs in parliament, he diſtinguiſhed himſelf in the houſe, in oppoſition to the motion for granting a ſubſidy and three fifteenths for the marriage of Henry VII.'s eldeſt daughter, Margaret, to the king of Scotland. The motion was rejected; and the king was ſo highly offended at this oppoſition from a beardleſs boy, that he revenged himſelf on Mr More's father, by ſending him on a frivolous pretence to the Tower, and obliging him to pay 100 l. for his liberty. Being now called to the bar, he was appointed law-reader at Furnival's inn, which place he held about three years; but about this time he alſo read a public lecture in the church of St Lawrence, Old Jewry, upon St Auſtin's treatiſe *De civitate Dei*, with great applauſe. He had indeed formed a deſign of becoming a Franciſcan friar, but was diſſuaded from it; and, by the advice of Dr Colet, married Jane, the eldeſt daughter of John Colt, Eſq; of Newhall in Eſſex. In 1508 he was appointed judge of the ſheriffs's court in the city of London, was made a juſtice of the peace, and became very eminent at the bar. In 1516 he went to Flanders in the retinue of Biſhop Tonſtal and Dr Knight, who were ſent by King Henry VIII. to renew the alliance with the archduke of Auſtria, afterwarks Charles V. On his return, Cardinal Wolſey would have engaged Mr More in the ſervice of the crown, and offered him a penſion, which he refuſed. Nevertheleſs, it was not long before he accepted the place of maſter of the requeſts, was created a knight, admitted of the privy council, and in 1520 made treaſurer of the exchequer. About this time he built a houſe on the bank of the Thames, at Chelſea, and married a ſecond wife. This wife, whoſe name was *Middleton*, and a widow, was old, ill tempered, and covetous: nevertheleſs Eraſmus ſays he was as fond of her as if ſhe were a young maid.

In the 14th year of Henry VIII. Sir Thomas More was made ſpeaker of the houſe of commons: in which capacity he had the reſolution to oppoſe the then powerful miniſter, Wolſey, in his demand of an oppreſſive ſubſidy; notwithſtanding which, it was not long before he was made chancellor of the duchy of Lancaſter, and was treated by the king with ſingular familarity. The king having once dined with Sir Thomas at Chelſea, walked with him near an hour in the garden, with his arm round his neck. After he was gone, Mr Roper, Sir Thomas's ſon-in-law, obſerved how happy he was to be ſo familiarly treated by the king: to which Sir Thomas replied, "I thank our lord, ſon Roper, I find his grace my very good lord indeed, and believe he doth as ſingularly favour me as any ſubject within this realm: howbeit, I muſt tell thee, I have no cauſe to be proud thereof; for if my head would win him a caſtle in France, it would not fail to go off." From this anecdote it appears, that Sir Thomas knew his grace to be a villain.

In 1526 he was ſent with Cardinal Wolſey and others, on a joint embaſſy to France, and in 1529 with Biſhop Tonſtal to Cambray. The king, it ſeems, was ſo well ſatisfied with his ſervices on theſe occaſions, that in the following year, Wolſey being diſgraced, he made him chancellor; which ſeems the more extraordinary, when we are told that Sir Thomas had repeatedly declared his diſapprobation of the king's divorce, on which the great *defenſor fidei* was ſo poſitively bent. Having executed the office of chancellor about three years, with equal wiſdom and integrity, he reſigned the ſeals in 1533, probably to avoid the danger of his refuſing to confirm the king's divorce. He now retired to his houſe at Chelſea; diſmiſſed many of his ſervants; ſent his children with their reſpective families to their own houſes (for hitherto he had, it ſeems, maintained all his children, with their families, in his own houſe, in the true ſtyle of an ancient patriarch); and ſpent his time in ſtudy and devotion: but the capricious tyrant would not ſuffer him to enjoy this tranquility. Though now reduced to a private ſtation, and even to indigence, his opinion of the legality of the king's marriage with Anne Boleyn was deemed of ſo much importance, that various means were tried to procure his approbation: but all perſuaſion proving ineffectual, he was, with ſome others, attainted in the houſe of lords of miſpriſion of treaſon, for encouraging Elizabeth Barton, the nun of Kent, in her treaſonable practices. His innocence in this affair appeared ſo clearly, that they were obliged to ſtrike his name out of the bill. He was then accuſed of other crimes, but with the ſame effect; till, refuſing to take the oath enjoined by the act of ſupremacy, he was commited to the Tower; and, after 15 months impriſonment, was tried at the bar of the King's-bench, for high treaſon, in denying the king's ſupremacy. The proof reſted on the ſole evidence of Rich the ſolicitor-general, whom Sir Thomas, in his defence ſufficiently diſcredited; nevertheleſs the jury brought him in guilty, and he was condemned to ſuffer as a traitor. The merciful Harry, however indulged him with ſimple decollation; and he was accordingly beheaded on Tower-hill, on the 5th of July 1535. His body which was firſt interred in the Tower, was begged by his daughter Margaret, and depoſited at the chancel of the church at Chelſea, where a monument, with an inſcription written by himſelf, had been ſome time before erected. This monument with the inſcription is ſtill to be ſeen in that church. The ſame daughter, Margaret, alſo procured his head after it had remained 14 days upon London-bridge, and placed it in a vault belonging to the Roper's family, under a chapel adjoining to St Dunſtan's church in Canterbury. Sir Thomas More was a man of ſome learning, and an upright judge; a very prieſt in religion, yet cheerful, and even affectedly witty (A). He wanted not ſagacity, where religion was out of the queſtion; but in that his faculties were ſo enveloped, as to render him a weak and credulous enthuſiaſt. He left one ſon and three daughters; of whom Margaret, the eldeſt, was very remarkable for her knowledge of the Greek and Latin languages. She married a Mr Roper of Well-hall in Kent, whoſe life of Sir Thomas More was publiſhed by Mr Hearne at Oxford in 1716. Mrs Roper died in 1544; and was buried in the vault of St Dunſtan's in Canterbury, with her father's head in her arms.

Sir Thomas was the author of various works, though his *Utopia* is the only performance that has ſurvived in the eſteem of the world; owing to the reſt being chiefly of a polemic nature; his anſwer to Luther has only gained him the credit of having the beſt knack of any man in Europe, at calling bad names in good Latin. His Engliſh works were collected and publiſhed by order of Queen Mary, in 1557; his Latin, at Baſil, in 1563, and at Louvain in 1566.

More (Sir Antonio), an eminent painter, was born at Utrecht in 1519. He became a ſcholar of John Schorel, but ſeems to have ſtudied the manner of Holbein, to which he approached nearer than to the freedom of deſign in the works of the great maſters that he ſaw at Rome. Like Holbein he was a cloſe imitator of nature, but did not arrive at his extreme delicacy of finiſhing; on the contrary, Antonio ſometimes ſtruck into a bold and maſculine ſtyle, with a good knowledge of the chiaro ſcuro. In 1542, he drew Philip II. and was recommended by cardinal Granvelle to Charles V. who ſent him to Portugal, where he painted John III. the king, Catherine of Auſtria his queen, and the infanta Mary firſt wife of Philip. For theſe three pictures he received 600 ducats, beſides a gold chain of 1000 florins, and other preſents. He had 100 ducats for his common portraits. But ſtill ampler rewards were beſtowed on him when ſent into England, to draw the picture of queen Mary, the intended bride of Philip. They gave him 100l. a gold chain, and a penſion of 100l. a quarter as painter to their majeſties. He made various portraits of the queen; one was ſent by cardinal Granvelle to the emperor, who ordered 200 florins to Antonio. He remained in England during the reign of Mary, and was much employed; but having neglected, as is frequent, to write the names on the portraits he drew, moſt of them have loſt part of their value, by our ignorance of the perſons repreſented. On the death of the queen, More followed Philip into Spain, where he was indulged in ſo much familiarity, that one day the king ſlapping him pretty roughly on the ſhoulder, More returned the ſport with his hand-ſtick; a ſtrange liberty (Mr Walpole obſerves), to be taken with a Spaniſh monarch, and with ſuch a monarch! A grandee interpoſed for his pardon, and he was ordered to retire to the Netherlands; but a meſſenger was diſpatched to recal him before he had finiſhed his journey. The painter, however, ſenſible of the danger he had eſcaped, modeſtly excuſed himſelf, and proceeded. At Utrecht he found the duke of Alva, and was employed by him to draw ſeveral of his miſtreſſes, and was made receiver of the revenues of Weſt Flanders; a preferment with which they ſay he was ſo elated, that he burned his Caſel and gave away his painting tools. More was a man of a ſtately and handſome preſence; and often went to Bruſſels, where he lived magnificiently. At what time or where he was knighted, is uncertain. He died at Antwerp in 1575, in the 56th year of his age. His portrait, painted by himſelf, is in the chamber of painters at Florence, with which the great duke, who bought it, was ſo pleaſed, that he ordered a cartel with ſome Greek verſes, written by Antonio Maria Salvini his Greek profeſſer, to be affixed to the frame. Another picture of himſelf, and one of his wife, were in the collection of Sir Peter Lely. King Charles had five pictures painted by this maſter. Mr Walpole mentions a number of others that are in England. But More did not always confine himſelf to portaits. He painted ſeveral hiſtoric pieces, particularly one much eſteemed of the reſurrection of Chriſt with two angels, and another of Peter and Paul. A painter, who afterwards ſold it to the prince of Condé, got a great deal of money by ſhowing it at the foire St Germaine. He made a fine copy of Titian's Danae for the king; and left unfiniſhed the Circumciſion deſigned for the altar in the church of our Lady at Antwerp.

Morin (Henry), an eminent Engliſh divine and philoſopher, in the 17th century, was educated at Eton ſchool, and in Chriſt-college in Cambridge, of which he became a fellow, and ſpent his life in a retired way, publiſhing a great number of excellent works. He refuſed Biſhopricks both in Ireland and England. He was an open-hearted ſincere Chriſtian philoſopher, who ſtudied to eſtabliſh men in the belief of providence againſt atheiſm. Mr Hobbes was uſed to ſay, that if his own philoſophy was not true, there was none

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(A) This laſt diſpoſition, we are told, he could not reſtrain even at his execution. The day being come, he aſcended the ſcaffold, which ſeemed ſo weak that it was ready to fall; whereupon, "I pray (ſaid he) ſee me ſafe up, and for my coming down let me ſhift for myſelf." His prayers being ended, he turned to the executioner, and with a cheerful countenance ſaid, "Pluck up thy ſpirits, man, and be not affraid to do thy office, my neck is very ſhort, take heed therefore thou ſtrike not awry for ſaving thy honeſty." Then laying his head upon the block, he bid him ſtay until he had put aſide his beard, ſaying, "That had never committed any treaſon."

More. | Moreelſe.

none that he ſhould ſooner like than our philoſopher's His writings have been publiſhed together in Latin and Engliſh, folio.

More (Alexander), was born at Caſtros in 1616. His father was a Scotſman, and principal of the college which the Calviniſts had in that city. Alexander was ſent to Geneva, where he was made profeſſor of Greek and of Theology, and at the ſame time diſcharged the office of a paſtor. His violent love of women, and the irregularity of his conduct, excited a great number of enemies againſt him. Saumaiſe, informed of his diſagreeable ſituation, invited him to Holland, where he was firſt appointed profeſſor of Theology at Middleburgh, and afterwards profeſſor of hiſtory at Amſterdam. The duties of theſe ſtations he diſcharged with great ability: and in 1655 he went to Italy, where he remained a conſiderable time, It was during his travels in Italy that he publiſhed his beautiful poem on the defeat of the Turkiſh fleet by the Venetians; and this work procured him the preſent of a golden chain from the republic. Having taken a diſlike to Holland, he was tranſlated to Charenton. There his ſermons attracted a numerous audience, not ſo much for their eloquence as for the ſatirical alluſions and witticiſms with which they abounded. This kind of ſtyle ſucceeded with him, becauſe it was natural; but in his imitators it appeared altogether ridiculous. The impetuoſity of his character brought him into new quarrels, eſpecially with Daillé, who had greatly the better of him in the diſpute.— This ſingular man died at Paris September 20th, 1670, aged 54, in the houſe of the ducheſs de Rohan. He was never married. His works are, 1. A Collection of Controverſial Tracts. 2. Beautiful Orations and Poems, in Latin. 3. An anſwer to Milton, intitled, *Alexandri, Mori fides publica.* Milton has attacked him with great ſeverity in his writings. Thoſe ſermons of his which are publiſhed, by no means juſtify the reputation which he had acquired for that kind of compoſition.

MOREA, formerly called the *Peloponneſus*, is a peninſula to the ſouth of Greece, to which it is joined by the iſthmus of Corinth. Its form reſembles a mulberry-leaf, and its name is derived from the great number of mulbery-trees which grow there. It is about 180 miles in length, and 130 in breadth. The air is temperate, and the land fertile, except in the middle, where it is full of mountains, and is watered by a great number of rivers. It is divided into three provinces; Scania, Belvedera, and Brazzo-di-Maina. It was taken from the Turks by the Venetians in 1687; but they loſt it again in 1715. The ſangiac of the Morea reſides at Modon. See Greece and Peloponneſus.

MOREAU (James), an eminent French phyſician, born at Chalons-ſur-Saone, was the diſciple and friend of the famous Guy Patin. He drew upon himſelf the jealouſy and hatred of the old phyſicians by the public theſes he maintained, and afterwards vindicated in his writings. He died in a very advanced age in 1729. He wrote in French, 1. Conſultations on the Rheumatiſm. 2. A chemical treatiſe on Fevers. 3. A phyſical diſſertation on the Dropſy; and other works which are eſteemed.

MOREELSE (Paul), an eminent painter, was born at Utrecht in 1575, and ſtudied painting under Michael Mirevelt. He was very ſucceſsful, not only in portraits, but hiſtorical ſubjects and architecture, particularly after he had improved his taſte by his ſtudies in Italy. We have ſome excellent wood-cuts in chiaro-ſcuro by this artiſt, who died in 1638.

Morel.

MOREL, the name of ſeveral celebrated printers to the kings of France, who, like the Stephenſes, were alſo men of great learning.

Frederic **Morel**, who was interpreter in the Greek and Latin tongues, as well as printer to the king, was heir to Vaſcoſan, whoſe daughter he had married.— He was born in Champagne, and he died in an advanced age at Paris 1513. His ſons and grandſons trode in his ſteps; they diſtinguiſhed themſelves in literature, and maintained alſo the reputation which he had acquired by printing. The edition of *St Gregory of Nyſſa*, by his ſon Claude Morel, is held in great eſtimation by the learned.

Morel (Frederic), ſon of the preceeding, and ſtill more celebrated than his father, was profeſſor and interpreter to the king, and printer in ordinary for the Hebrew, Greek, Latin, and French languages. He was ſo devoted to ſtudy, that when he was told his wife was at the point of death, he would not ſtir till he had finiſhed the ſentence which he had begun. Before it was finiſhed, he was informed that ſhe was actually dead; *I am ſorry for it* (replied he coldly) *ſhe was an excellent woman.* This printer acquired great reputation from the works which he publiſhed, which were very numerous and beautifully executed. From the manuſcripts in the king's library, he publiſhed ſeveral treatiſes of St Baſil, Theodoret, St Cyrille; and he accompanied them with a tranſlation. His edition of the works of Œcumenius and Aretas. in 2 vols folio, is much eſteemed. In ſhort, after diſtinguiſhing himſelf by his knowledge in the languages, he died June 27, 1630, at the age of 78. His ſons and grandſons followed the ſame profeſſion.

Morel (William), regius profeſſor of Greek, and director of the king's printing houſe at Paris, died 1564. He compoſed a *Dictionaire Grec-Latin-François*, which was publiſhed in quarto in 1622, and ſome other works which indicate very extenſive learning. His editions of the Greek authors are exceedingly beautiful. This great ſcholar, who was of a different family from the preceding, had a brother named John, who died in priſon (where he had been confined for hereſy) at the age of 20, and whoſe body was dug out of the grave, and burnt Feb. 27, 1559. They were of the pariſh of Tilleul, in the county of Mortein, in Normandy.

Morel (Dom Robert), a benedictine monk of the ſociety of Saint-Maur, was born at Chaiſe-Dieu in Auvergne, A. D. 1653. He was appointed keeper of the library of Saint-Germain des Pres in 1680. He was afterwards ſuperior of different religious houſes. In 1699 he diſengaged himſelf from every care, and retired to Saint Denys, where he ſpent his time in compoſing works of practical religion. This learned monk, who enjoyed from nature a lively and fruitful imagination, excelled chiefly in ſubjects of piety, in a knowledge of the chriſtian character, and of the rules which regard the conduct of the Chriſtian life. His converſation was ſprightly and refined, his anſwers were prompt and ingenious, his temper was gentle, equable, and full of gaiety mingled with diſcretion. His ſlovenly appearance did not debaſe the beauty of his mind. All his words breathed charity, piety, uprightneſs, ſincerity, and innocence of manners. Great ſimplicity and modeſty, the limits of which he never tranſgreſſed, concealed his excellencies from the vulgar, but made him rank higher in the eſtimation of the wiſe and ſenſible part of mankind. Dom Morel died A. D. 1731, aged 79. His principal works are, 1. *Effuſions de cœur ſur chaque verſe des Pſeaumes et des Cantiques de l'Egliſe*; Paris, 1716, in 5 vols. 12mo. P. de Tournemine, a Jeſuit, eſteemed this book (which abounds in pious and affecting thoughts and expreſſions) ſo much, that he peruſed it conſtantly; and when he was obliged to go to the country he always carried a volume of it along with him. He earneſtly ſought to be introduced to the author, and intreated on his knees that he would grant him his benediction (*Hiſtoire literaire de la congregation de Saint Maur, p.* 504) 2. *Entretiens ſpirituels ſur les Evangiles des Dimanches et des Myſteres de toute l'anneé, diſtribués pour tous les jours de l'Avent*, 1720, 4 vols 12mo, 3. *Entretiens ſpirituels, pour ſervir de preparation á la Mort*, 12mo, 1721. 4. *Imitation de N. S-I. C.* a new tranſlation, with a pathetic prayer, or an effuſion of the heart, at the concluſion of every chapter, in 12mo, 1723. 5. *Meditations Chretiennes ſur les Evangiles de toute l'anneé*, 2 vols. 12mo, 1726. 6. *De l'Eſperance Chretienne et de la Confiance en la miſericorde de Dieu*, 12mo, 1728. The greater part of Morel's works are devotional; and his obſervations are drawn chiefly from the ſcriptures, and from the practical writings of the fathers. This circumſtance greatly raiſed the reputation of his works, and at the ſame time excited the envy and ill-will of his enemies. By them he was conſidered as a Janſeniſt; and in this light he is repreſented in in the *Dictionnaire des livres Janſeniſtes*.

Morel (Andreas), a very eminent antiquary, born at Berne in Switzerland. Having a ſtrong paſſion for the ſtudy of medals, he travelled through ſeveral countries, and made large collections: in 1683 he publiſhed at Paris, in 8vo, *Specimen univerſæ rei nummariæ antiquæ*: and the great work of which this was the ſpecimen was to be a complete collection of all ancient medals, of which he had at that time 20,000 exactly deſigned. Soon after this eſſay appeared, Louis XIV. gave him a place in his cabinet of antiques, in which capacity he brought himſelf into great danger by ſpeaking too freely of M. Louvois on account of the neglect in paying his ſalary, or on ſome other private account, as he was committed to the Baſtile, where he lay for three years; nor was he releaſed until the death of Louvois, nor till the canton of Berne had interceded in his favour. He afterward accepted an invitation from the count of Schwartzburg at Arnſtadt, in Germany, with whom he lived in the capacity of antiquary, and was furniſhed with every thing neceſſary for carrying on his grand work. In 1703 he died; and in 1734 came out at Amſterdam part of this collection, in 2 vols. folio, under the title of *Theſaurus Morellianus, ſive familiarum Romanorum numiſmata omnia, diligentiſſime undique conquiſita*, &c. *Nunc primum edidit & commentario perpetuo illuſtravit Sigebertus Havercampus.* Theſe volumes contain an explication of 3539 medals, engraved, with their reverſes.

MORENA, (anc. geog.), a diſtrict or diviſion of Myſia, in the Hither Aſia. A part of which was occupied by Cleon, formerly at the head of a band of robbers, but afterward prieſt of Jupiter Abrettenus, and enriched with poſſeſſions, firſt by Antony, and then by Cæſar.

MORESBY, a harbour a little above Whitehaven, in Cumberland; in and about which many remains of antiquity have been dug up, ſuch as altars and ſtones, with inſcriptions on them; and ſeveral caverns have been found called Pict's Holes. Here is ſuppoſed to have been a Roman fortification.

MORESQUE, Morisk, or *Moriſko*, a kind of painting, carving, &c. done after the manner of the Moors; conſiſting of ſeveral groteſque pieces and compartiments promiſcuouſly intermingled, not containing any perfect figure of a man, or other animal, but a wild reſemblance of birds, beaſts, trees, &c. Theſe are alſo called *arabeſques*, and are particularly uſed in embroideries, damaſk-work, &c.

Moresque-dances vugarly called *Morrice-dances* are thoſe altogether in imitation of the Moors, as ſarabands, chacons, &c. and are uſually performed with caſtanets, tambours, &c.

There are few country places in England where the morrice-dance is not known. It was probably introduced about, or a little before the reign of Henry VIII. and is a dance of young men in their ſhirts, with bells at their feet, and ribbands of various colours tied round their arms and flung acroſs their ſhoulders.

MORETON, a town of Devonſhire, with a market on Saturdays, ſeated on a hill, near Dartmore, and is a pretty large place, with a noted market for yarn. It is 14 miles ſouth-weſt of Exeter, and 185 weſt by ſouth of London. W. Long. 3. 46. N. Lat. 50. 39.

Moreton, a town in Glouceſterſhire, whoſe market is diſuſed. It is a good thoroughfare, and ſeated on the Foſſeway, 29 miles eaſt-ſouth-eaſt of Worceſter, and 83 weſt-north-weſt of London. W. Long. 3. 36. N. Lat. 52. 0.

MORGAGNA. See Fata.

MORGAGNI (John Baptiſt), doctor of medicine firſt profeſſor of anatomy in the univerſity of Padua, and member of ſeveral of the moſt eminent ſocieties of learned men in Europe, was born in the year 1682, at Forli, a town in the diſtrict of *La Romagna* in Italy. His parents, who were in eaſy circumſtances, allowed him to follow that courſe in life his genious dictated. He began his ſtudy at the place of his nativity; but ſoon after removed to Bologna, where he obtained the degree of Doctor of Medicine, when he had but juſt reached the 16th year of his age. Here his peculiar taſte for anatomy found an able preceptor in Valſalva, who beſtowed on him the utmoſt attention; and ſuch was the progreſs he made under this excellent maſter, that at the age of 20 he himſelf taught anatomy with high reputation. Soon, however, the fame of his prelections, and the number of his pupils excited the jealouſy of the public profeſſors, and gave riſe to invidious perſecutions. But his abilities and prudence gained him a complete triumph over his enemies; and all oppoſition to him was finally terminated from his being appointed by the ſenate of Bologna to fill a medical chair, which ſoon became vacant. But the duties of this office, although important, neither occupied ed the whole of his time, nor ſatisfied his anxious deſire to afford inſtruction. He ſtill continued to labour in ſecret on his favourite ſubject, and ſoon after communicated the fruits of theſe labours to the public in his *Adverſaria Anatomica*, the firſt of which was publiſhed in the year 1706, the ſecond and third in 1717, and the three others in 1719. The publication of this excellent work ſpread the fame of Morgagni far beyond the limits of the ſtate of Bologna. Such was his reputation, that the wiſe republic of Venice had no heſitation in making him an offer of the ſecond chair of the theory of medicine in the univerſity of Padua, then vacant by the death of M. Molinetti; and, to enſure his acceptance, they doubled the emoluments of that appointment. While he was in this department he publiſhed his treatiſe, entitled *Nova inſtitutionum medicarum idea*, which firſt appeared at Padua in the year 1712. From this work his former reputation ſuffered no diminution. And ſoon after he roſe, by different ſteps, to be firſt profeſſor of anatomy in that celebrated univerſity. Although Morgagni was thus finally ſettled at Padua, yet he gave evident proofs of his gratitude and attachment to Bologna, which he conſidered as his native country with reſpect to the ſciences. He exerted his utmoſt efforts in eſtabliſhing the academy of Bologna, of which he was one of the firſt aſſociates; and he enriched their publications with ſeveral valuable and curious papers. Soon after this, the Royal ſocieties of London and Paris received him among their number. Not long after the publication of his *Adverſaria Anatomica*, he began, much upon the ſame plan, his *Epiſtolæ Anatomicæ*, the firſt of which is dated at Padua in the beginning of April 1726. The works of Morgagni which have already been mentioned, are to be conſidered, in a great meaſure, as ſtrictly anatomical: but he was not more eminent as an anatomiſt, than as a learned and ſucceſsful phyſician. In the year 1760, when he was not far diſtant from the 80th year of his age, he publiſhed his large and valuable work *De cauſis et ſedibus morborum per anatomen indagatis*. This laſt and moſt important of all his productions will afford convincing evidence of his induſtry and abilities to lateſt poſterity. Beſides theſe works, he publiſhed, at different periods of his life, ſeveral miſcellaneous pieces, which were afterwards collected into one volume, and printed under his own eye at Padua, in the year 1765. It does not appear that he had in view any favourite publications; but he intended to have favoured the world with a complete edition of all his works, which would probably have been augmented with many new obſervations. In this he was engaged when, on the 5th of December 1771, after he had nearly arrived at the 90th year of his age, death put a period to his long and glorious career in the learned world.

MORGANA, or MORGAGNA, *Fata*. See FATA.

MORGES, a handſome and rich town of Swiſſerland, in the canton of Bern, and capital of a bailiwick, with a caſtle where the bailiff reſides. It is a place of ſome trade on account of a canal, from which they tranſport merchandizes from the lake of Geneva to other parts. There is a fine proſpect from it, and it is ſeated on the lake of Geneva, five miles from Lauſanne. E. Long. 6. 42. N. Lat. 46. 29.

MORGO, anciently *Amorgos*, an iſland in the Archipelago, fertile in wine, oil, and corn. It is well cultivated, and the inhabitants are affable, and generally of the Greek church. The beſt parts belong to a monaſtery. The greateſt inconvenience in this iſland is the want of wood. It is 30 miles in circumference. E. Long. 26.15. N. Lat. 36. 30.

MORHANGE, a town of Germany, in Lorrain, whoſe lord has the title of Rhinegrave, and depends on the empire. It is 24 miles north-eaſt of Nanci, and 200 eaſt of Paris, E. Long. 6. 42. N. Lat. 48. 51.

MORHOFF (Daniel George), a very learned German, born at Wiſmar in the duchy of Mecklenburgh, in 1639. The duke of Holſtein, when he founded an univerſity at Kiel, made him profeſſor of eloquence and poetry there in 1665; to which was afterwards added the profeſſorſhip of hiſtory, and in 1680 the office of librarian to the univerſity. He was the author of many works of a ſmall kind; as orations, diſſertations, theſes, and poems: but his chief work was his *Polyhiſtor, ſive de notitia auctorum et rerum commentarii*, firſt publiſhed at Lubec in 1688: which has been greatly enlarged ſince his death in 1691, and gone through ſeveral ſucceſſive editions,

MORIAH, one of the eminences of Jeruſalem; on which Abraham went to offer his ſon, and David wanted to build the temple, which was afterwards executed by Solomon; the threſhing-floor of Araunah; originally narrow, ſo as ſcarce to contain the temple, but enlarged by means of ramparts; and ſurrounded with a triple wall, ſo as to add great ſtrength to the temple, (Joſephus). It may be conſidered as a part of Mount Sion, to which it was joined by a bridge and gallery. *(Id.)*

MORILLES, a kind of muſhroom, about the bigneſs of a walnut, pierced with holes like a honeycomb, and ſaid to be good for creating an appetite. They are alſo accounted reſtorative, and frequently uſed in ſauces and ragouts.

MORILLOS, (Bartholomew), of Seville in Spain, was born A. D. 1613. After having cultivated painting with ſucceſs in his own country, he travelled into Italy, where he was greatly admired for a manner peculiar to himſelf, and capable of producing a wonderful effect. The Italians, aſtoniſhed at the excellence of his genius and the freſhneſs of his colouring, did not heſitate to compare him to the celebrated Paul Veroneſe. On his return to Spain, Charles II. brought him to court, with the intention of making him his firſt painter: but Morillos declined the offer, pretending, as an excuſe, that his age would not permit him to accept of an employment of ſuch importance. His extreme modeſty, however, was the ſole cauſe of his refuſal. He died in 1685, aged 72 years.

MORIN (John Baptiſt), phyſician and regius profeſſor of mathematics at Paris, was born at Villefranch in Beauſolois, in 1583. After commencing Doctor at Avignon, he went to Paris, and lived with Claude Dormi biſhop of Boulogne, who ſent him to examine the mines of Hungary; and thereby gave occaſion to his *Mundus ſublunaris anatomia*, which was his firſt production, and publiſhed in 1619. Upon his return to his patron the biſhop, he contracted an attachment to judicial aſtrology, concerning which he furniſhed the world with many ridiculous ſtories, and wrote a great number of books not worth enumerating. He died in 1656 before he had finiſhed the favourite labour of his life, which was his *Aſtrologia Gallica.* Louiſa Maria de Gonzaga queen of Poland gave 2000 crowns to carry on the edition, at the recommendation of one of her ſecretaries, who was a lover of aſtrology; and it appeared at the Hague in 1661, in one vol. folio, with two dedications, one to Jeſus Chriſt, and another to the queen of Poland.

Morin (John), a very learned Frenchman, born at Blois, of Proteſtant parents, in 1591; but converted by cardinal du Perron to the catholic religion. He publiſhed, in 1626, ſome Exercitations upon the original of Patriarchs and Primates, and the ancient uſage of eccleſiaſtical cenſures; dedicated to pope Urban VIII. In 1628 he undertook the edition of the Septuagint Bible, with Nobilus's verſion; and placed a preface before it, in which it treats of the authority of the Septuagint, and prefers the verſion in the edition made at Rome by order of Sixtus V. to the preſent Hebrew text, which he affirms has been corrupted by the Jews. About the ſame time he gave a French Hiſtory of the deliverance of the church by the emperor Conſtantine, and of the temporal greatneſs conferred on the Roman church by the kings of France. He afterwards publiſhed Exercitations upon the Samaritan Pentateuch; and took the care of the Samaritan Pentateuch, for the Polyglot then preparing at Paris. He was greatly careſſed at Rome; where after living nine years at the invitation of cardinal Barbarini, he was recalled by Cardinal Richelieu, and died at Paris in 1659. His works are very numerous; and ſome of them as much valued by Proteſtants as Papiſts for the oriental learning they contain.

Morin (Simon), a celebrated fanatic of the 17th century, was born at Richemont, near Aumale, and had been clerk to Mr Charron, general paymaſter of the army. He was very ignorant and illiterate; and therefore it is no wonder if, meddling in ſpiritual matters, he fell into great errors. He was not content with broaching his whimſies in converſation, but wrote them down in a book, which he cauſed to be privately printed in 1647, under the title of *Penſées de Morin dédiées au Roi.* This book is a medley of conceit and ignorance, and contains the moſt remarkable errors which were afterwards condemned in the Quietiſts; only that Morin carries them to a greater length than any one elſe had done; for he affirms, "that the moſt enormous ſins do not remove a ſinner from the ſtate of grace, but ſerve on the contrary to humble the pride of man." He ſays, "that in all ſects and nations God has a number of the elect, true members of the church; that there would ſoon be a general reformation, all nations being juſt about to be converted to the true faith; and that this great reformation was to be effected by the ſecond coming of Jeſus Chriſt, and Morin incorporated with him."—He was in priſon at Paris, at the time when Gaſſendi's friends were writing againſt the aſtrologer John Baptiſt Morin, whom they upbraided (but, as he replied, falſely) with being the brother of this fanatic. This was about 1650; after which Simon Morin was ſet at liberty as a viſionary; and ſuffered to continue ſo till 1661, when Des Marets de St Sorlin, who, though a fanatic and viſionary himſelf, had conceived a violent averſion to him, diſcovered his whole ſcheme and had him taken up. The means Des Marets made uſe of for this diſcovery was by pretending to be one of his diſciples; and he carried his treachery and diſſimulation ſo far, as to acknowledge him for "the Son of man riſen again." This acknowledgment ſo pleaſed Morin, that he conferred upon him, as a particular grace the office of being his harbinger, calling him *a real John the Baptiſt revived.* Then Des Marets impeached him, and became his accuſer; upon which Morin was brought to a trial, and condemned to be burnt alive. This ſentence was executed on him at Paris, March 14th, 1663, in the form and manner following: After having made the *amende honourable* in his ſhirt with a cord about his neck and a torch in his hand, before the principal gate of the church of Notre Dame, he was carried to the place of execution, and there tied to a ſtake to be burnt alive together with his book intituled *Penſées de Morin,* as alſo all his papers and his trial. Afterwards his aſhes were thrown into the air, as a puniſhment for his having aſſumed the title of the Son of God. His accomplices, too, were condemned to aſſiſt at his execution, and then to ſerve in the galleys for life, after having been whipped by the hangman, and marked with a burning iron with *fleurs de lis* upon the right and left ſhoulders. Morin gave out that he would riſe again the third day; which made many of the mob gather together at the place where he was burnt.—It is ſaid, that when the preſident de Lamoignon aſked him, whether it was written in any part of Scripture, that the great prophet or new Meſſiah ſhould paſs through the fire? he cited this text by way of anſwer; *Igne me examinaſti, et non eſt inventa in me iniquitas;* that is, "Thou haſt tried me with fire, and no wickedneſs hath been found in me." Morin died with remarkable reſolution; and it was then thought the judges had been too rigorous in their ſentence, and that ſending him to a mad-houſe would have been ſufficient. They replied in defence of themſelves, that Morin had owned many impious tenets; and that not in ſudden ſtarts and fits of heat, but in cool blood, and with deliberate obſtinacy. But then a queſtion will ariſe, whether a fool, any more than a madman, ought to be capitally puniſhed for any opinion or degree of ſtubborneſs?

Morin (Peter), was born at Paris, A. D. 1531: he went into Italy, and was employed by the learned Paulus Manucius in his printing houſe at Venice.—He afterwards taught Greek and coſmography at Vicencia whence he was called to Ferrara by the duke of that name. St Charles Borromeus, informed of his profound knowledge in eccleſiaſtical antiquities, of his diſintereſtedneſs, of his zeal and piety, offered him his friendſhip, and engaged him to go to Rome in 1575. The popes Gregory XIII. and Sixtus V. employed him in an edition of the Septuagint, 1587, and in one of the Vulgate, 1590, in folio. He alſo ſpent much of his time on an edition of the Bible tranſlated from the Septuagint, and publiſhed at Rome, 1588, in folio; on an edition of the Decretals to the

time

the time of Gregory VII. publiſhed at Rome, 1591; and on a Collection of General Councils, likewiſe publiſhed at Rome, 1608, 4 vols. This learned critic died at Rome, 1608, aged 77. His character was open, ſimple, ſincere, gentle, and honeſt; his temper was equal and agreeable. He was an enemy to artifice and cunning; he deſpiſed riches and honours; and he ſeemed to have a paſſion for nothing but ſtudy.—He ſpoke Italian with as much eaſe and propriety as the moſt intelligent native. He left behind him *Un Traité du bon uſage des Sciences*, and ſome other writings, publiſhed by Father Quetif, a Dominican friar, in 1675. His works diſplay great reſearch and excellent principles; and the author appears to have been well acquainted with the belles lettres and the languages. His edition of the Septuagint, printed at Rome, 1687, in folio, is now very ſcarce.

Morin (Stephen), miniſter of the Proteſtant reformed religion at Caen, the place of his birth, was admitted a member of the Academy of Belles Lettres in that city, notwithſtanding an expreſs law which excluded Proteſtants. His great learning gained him this mark of diſtinction. After the revocation of the edict of Nantes, he retired to Leyden in 1685, and from that to Amſterdam, where he was appointed profeſſor of Oriental languages. He died in 1700, at the age of 75, after being long ſubject to infirmities both of body and mind. He publiſhed eight diſſertations in Latin relating to ſubjects of antiquity, which are extremely curious. The Dordrecht edition of 1700, 8vo, is the beſt, and preferable to that publiſhed at Geneva in 1683, 4to. He wrote likewiſe the life of Samuel Bochart.

Morin (Henry), ſon to the preceding, was born at Saint-Pierre-Sur-Dive, in Normandy, and became a Roman Catholic after he had been a Proteſtant miniſter. He is the author of ſeveral diſſertations which are to be found in the Memoirs of the Academy of Inſcriptions, of which he was a member. He died at Caen, on the 16th of July 1728, aged 60, as much eſteemed as his father.

Morin (Lewis), was born at Mans in 1635. He went on foot to Paris to ſtudy philoſophy, and collected herbs during the whole journey. He afterwards ſtudied phyſic, and lived in the manner of an anchorite, on bread and water, or at moſt but a few fruits, being his whole ſubſiſtence. Paris was to him a hermitage; with this exception, that it furniſhed him with books, and with the converſation and acquaintance of the learned. He received the degree of doctor of medicine in 1662; and, after ſeveral years practice, he was expectant at the Hotel-Dieu. His reputation made Mademoiſelle de Guiſe chooſe him for her firſt phyſician, and the Academy of Sciences for one of its members. He died A. D. 1715, aged 80. A long and vigorous life, with a gentle and eaſy death, were the rewards of his temperance. The exerciſes of religion and the duties of his ſtation occupied his whole time. No part of it was ſpent in paying or receiving viſits. "Thoſe who come to ſee me (ſaid he) do me honour; thoſe who do not come, lay me under an obligation." "It was only an Anthony (ſaid Fontenelle) who could viſit this Paul." He left a library valued at 20,000 crowns, an herbal together with a cabinet of medals; and this ſeems to have been his whole fortune. His mental enjoyments had been much more expenſive than thoſe of the body. An index to Hippocrates, in Greek and Latin, much more copious and better finiſhed than that of Pinus, was found among his papers.

Morin (John), was born at Meung near Orleans in 1705, and in 1732 he was appointed profeſſor of philoſophy at Chartres. In 1750 the biſhop of Chartres rewarded his long and aſſiduous attention to claſſical learning by a canonry in the cathedral. At the age of 38, Morin publiſhed his *Mechaniſme Univerſel*, one volume 12mo, which contains a great deal of information, but much more conjecture. His next work was a Treatiſe on Electricity, publiſhed in 1748. His third and laſt performance was an anſwer to the Abbé Nollet, who had attacked his opinions concerning electricity. His reputation was not limited to the province in which he lived: he was well known to the academies of ſciences at Paris and Rouen, with whom he frequently correſponded. He continued his application to the ſciences, and diſplayed the virtues of the prieſt and the philoſopher to the laſt hour of his life. This valuable man died at Chartres, on the 28th of March 1764, at the age of 59.

MORINA, in botany: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. The corolla is unequal; the calyx of the fruit is monophyllous and dented; the calyx of the flower bifid; there is one ſeed under the calyx of the flower.

MORINORUM Castellum (anc. geog.), ſimply Caſtellum (Antoine); ſituated on an eminence, with a ſpring of water on its top, in the territory of the Morini. Now *Mont Caſſel*, in Flanders.

MORINDA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. The flowers are aggregate and monopetalous; the ſtigmata bifid; the fruit plums aggregate, or in cluſters.

MORISON (Robert), a phyſician and profeſſor of botany at Oxford, was born at Aberdeen in 1620, bred at the univerſity there, and taught philoſophy for ſome time in it; but having a ſtrong inclination to botany, made great progreſs in it. The civil wars obliged him to leave his country; which, however, he did not do till he had firſt ſignalized his zeal for the intereſt of the king, and his courage, in a battle fought between the inhabitants of Aberdeen, and the Preſbyterian troops on the bridge of Aberdeen, in which he received a dangerous wound on the head. As ſoon as he was cured of it, he went into France; and fixing at Paris, he applied aſſiduouſly to botany and anatomy. He was introduced to the duke of Orleans, who gave him the direction of the royal gardens at Blois. He exerciſed the office till the death of that prince, and afterwards went over to England in 1660. Charles II. to whom the duke of Orleans had preſented him at Blois, ſent for him to London, and gave him the title of his *phyſician*, and that of *profeſſor royal of botany*, with a penſion of 200 l. *per annum*. The *Præludia Botanicum*, which he publiſhed in 1669, procured him ſo much reputation, that the univerſity of Oxford invited him to the profeſſorſhip of botany in 1669;

which he accepted, and acquitted himſelf in it with great ability. He died at London in 1683, aged 63. He publiſhed a ſecond and third part of his Hiſtory of Plants, in 2 vols. folio; with this title, *Plantarum Hiſtoria Oxonienſis Univerſalis.* The firſt part of this excellent work has not been printed: and it is not known what has become of it.

MORISONIA, in botany: A genus of the polyandria order, belonging to the monadelphia claſs of plants and in the natural method ranking under the 25th order, *putamineæ.* The calyx is ſingle and bifid; the corolla tetrapetalous; there is one piſtil; the berry has a hard bark, is unilocular, polyſpermous, and pedecellated.

MORLACHIA, a mountainous country of Dalmatia. The inhabitants are called *Morlacks*, or *Morlabi;* they inhabit the pleaſant valleys of Koter, along the rivers Kerha, Cettina, Marenta, and among the inland mountains of Dalmatia. The inhabitants are by ſome ſaid to be of Walachian extraction, as (according to theſe authors) is indicated even by their name; Morlachia being a contraction of *Mauro-walachia*, that is, *Black Walachia:* and the Walachians are ſaid to be deſcendants of the ancient Roman colonies planted in theſe countries. This, however, is denied by the Abbé Fortis, who hath publiſhed a volume of travels into that country. He informs us, that the origin of the Morlacchi is involved in the darkneſs of barbarous ages, together with that of many other nations, reſembling them ſo much in cuſtoms and language, that they may be taken for one people, diſperſed in the vaſt tracks from the adriatic ſea to the frozen ocean. The emigrations of the various tribes of the Slavi, who, under under the names of *Scythians*, *Geti*, *Goths*, *Hunns*, *Slavini*, *Croats*, *Avari*, and *Vandals*, invaded the Roman empire, and particularly the Illyrian provinces during the decline of the empire, muſt have ſtrangely perplexed the genealogies of the nations which inhabited it, and which perhaps removed thither in the ſame manner as at more remote periods of time. The remainder of the Ardiæi, Autariati, and other Illyrian people anciently ſettled in Dalmatia who probably could not reconcile themſelves to a dependance on the Romans, might nevertheleſs naturally enough form an union with foreign invaders not unlike themſelves in dialect and cuſtoms; and, according to our author, it ſeems no ill-founded conjecture, that many families driven out of Hungary by the irruption of the Moguls under Jenghiz Khan and his ſucceſſors might people the deſerted valleys between the mountains of Dalmatia. This conjecture is alſo ſomewhat confirmed by the traces of the Calmuck Tartars, which are ſtill to be found in a part of that country called *Zara.*

With regard to the etymology of the name, the Abbé obſerves, that the Morlacchi generally call themſelves, in their own language, *Vlaſſi;* a national term, of which no veſtige is found in the records of Dalmatia till the 13th century. It ſignifies *powerful men or men of authority;* and the denomination of *Moro Vlaſſi*, corruptly *Morlacchi*, as they are now called, may perhaps point out the original of the nation. This word may poſſibly ſignify the *conquerors that came from the ſea; Mor*, in all the dialects of the Sclavonian language, ſignifying the *ſea.*

The Morlacchi are ſo different from the inhabitants of the ſea-coaſts in dialect, dreſs, diſpoſitions, and cuſtoms, that they ſeem clearly to be of a different original, or at leaſt the colonies muſt have ſettled at ſuch diſtant periods from each other, that they have had time to alter in a great meaſure their national character. There is alſo a remarkable diverſity among the Morlacchi themſelves in ſeveral diſtricts, probably on account of the different countries from whence they came.

With regard to the character of theſe people, we are informed that they are much injured by their maritime neighbours. The inhabitants of the ſea-coaſt of Dalmatia tell many frightful ſtories of their avarice and cruelty; but theſe, in our author's opinion, are all either of an ancient date, or if any have happened in latter times, they ought rather to be aſcribed to the corruption of a few individuals, than to the diſpoſition of the nation in general; and though thieviſh tricks are frequent among them, he informs us, that a ſtranger may travel ſecurely through their country, where he is faithfully eſcorted, and hoſpitably treated. The greateſt danger is from the *Haiduks* or *Banditti*, of whom there are great numbers among the woods and caves of theſe dreadful mountains on the confines. There, ſays our author, a man ought to get himſelf eſcorted by a couple of theſe "honeſt fellows;" for they are not capable of betraying him although a banditti; and their ſituation is commonly more apt to raiſe compaſſion than diffidence. They lead their life, among the wolves, wandering from one precipice to another, expoſed to the ſeverity of the ſeaſons, and frequently languiſh in want of the neceſſaries of life, in the moſt hideous and ſolitary caverns. Yet they very ſeldom diſturb the tranquility of others, and prove always faithful guides to travellers; the chief objects of their rapine being ſheep and oxen, to ſupply themſelves with food and ſhoes. Sometimes it happens, that in their extreme neceſſity the Haiduks go in parties to the ſhepherds cottages, and rudely demand ſomething to eat; which they do not fail to take immediately by force if the leaſt heſitation is made. It is ſeldom indeed they meet with a refuſal, or with reſiſtance, as their reſolution and fury are well known to be equal to the ſavage life they lead. Four Haiduks are not afraid to aſſault a caravan of 15 or 20 Turks, and generally plunder and put them to flight. The greateſt part of the Haiduks look upon it as a meritorious action to ſhed the blood of the Turks; to which cruelty they are eaſily led by their natural ferocity, inflamed by a miſtaken zeal for religion, and the diſcourſes of their fanatic prieſts.

As to the Morlacchi themſelves, they are repreſented as open and ſincere to ſuch a degree, that they would be taken for ſimpletons in any other country; and by means of this quality they have been ſo often duped by the Italians, that *the faith of an Italian* and *the faith of a dog* are ſynonymous among the Morlacchi. They are very hoſpitable to ſtrangers; and their hoſpitality is equally conſpicuous among the rich and poor. The rich prepares a roaſted lamb or ſheep, and the poor with equal cordiality offers whatever he has; nor is this generoſity confined to ſtrangers, but generally extends itſelf to all who are in want.

Morlachia. When a Morlack is on a journey, and comes to lodge at a friend's houſe, the eldeſt daughter of the family, or the new-married bride if there happens to be one, receives and kiſſes him when he alights from his horſe or at the door of the houſe: but a foreigner is rarely favoured with theſe female civilities; on the contrary, the women, if they are young, hide themſelves, and keep out of his way.

The Morlacchi in general have little notion of domeſtic œconomy, and readily conſume in a week as much as would be ſufficient for ſeveral months, whenever any occaſion of merriment preſents itſelf. A marriage, the holiday of the ſaint, protector of the family, the arrival of relations or friends, or any other joyful incident, conſumes of courſe all that there is to eat and to drink in the houſe. Yet the Morlack is a great œconomiſt in the uſe of his wearing-apparel; for rather than ſpoil his new cap, he takes it off let it rain ever ſo hard, and goes bareheaded in the ſtorm. In the ſame manner he treats his ſhoes, if the road is dirty and they are not very old. Nothing but an abſolute impoſſibility hinders a Morlack from being punctual; and if he cannot repay the money he borrowed at the appointed time, he carries a ſmall preſent to his creditor, and requeſts a longer term. Thus it happens ſometimes, that, from term to term, and preſent to preſent, he pays double what he owed, without reflecting on it.

Friendſhip, that among us is ſo ſubject to change on the ſlighteſt motives, is laſting among the Morlacchi. They have even made it a kind of religious point, and tie the ſacred bond at the foot of the altar. The Sclavonian ritual contains a particular benediction for the ſolemn union of two male or two female friends in the preſence of the congregation. The male friends thus united are called *Pobratimi*, and the female *Poſeſtreme*, which mean half-brothers and half-ſiſters. Friendſhips between thoſe of different ſexes are not at this day bound with ſo much ſolemnity, though perhaps in more ancient and innocent ages it was alſo the cuſtom.

From theſe conſecrated friendſhips among the Morlacchi and other nations of the ſame origin, it ſhould ſeem that the *ſworn brothers* aroſe; a denomination frequent enough among the common people of Italy and in many parts of Europe. The difference between theſe and the Probratimi of Morlacchia conſiſt not only in the want of the ritual ceremony, but in the deſign of the union itſelf. For, among the Morlacchi, the ſole view is reciprocal ſervice and advantage; but ſuch a brotherhood among the Italians is generally commenced by bad men, to enable them the more to hurt and diſturb ſociety. The duties of the Pobratimi are, to aſſiſt each other in every caſe of need or danger, to revenge mutual wrongs, and ſuch like. The enthuſiaſm is often carried ſo far as to riſk and even to loſe their life for the Pobratimi, although theſe ſavage friends are not celebrated like a Pylades. If diſcord happens to ariſe between two friends, it is talked of over all the country as a ſcandalous novelty; and there has been ſome examples of it of late years, to the great affliction of the old Morlacchi, who attribute the depravation of their countrymen to their intercourſe with the Italians. Wine and ſtrong liquors, of which the nation is beginning to make daily abuſe, will of courſe produce the ſame bad effects as among others. Morlachia.

But as the friendſhips of the Morlacchi are ſtrong and ſacred, ſo their quarrels are commonly unextinguiſhable. They paſs from father to ſon; and the mothers fail not to put their children in mind of their duty to revenge their father if he has had the misfortune to be killed, and to ſhow them often the bloody ſkirt and arms of the dead. And ſo deeply is revenge rooted in the minds of this nation, that all the miſſionaries in the world would not be able to eradicate it. A Morlack is naturally inclined to do good to his fellow-creatures, and is full of gratitude for the ſmalleſt benefit; but implacable if injured or inſulted.

A Morlack who has killed another of a powerful family, is commonly obliged to ſave himſelf by flight, and to keep out of the way for ſeveral years. If during that time he has been fortunate enough to eſcape the ſearch of his purſuers, and has got a ſmall ſum of money, he endeavours to obtain pardon and peace; and, that he may treat about the conditions in perſon, he aſks and obtains a ſafe conduct, which is faithfully maintained, though only verbally granted. Then he finds mediators; and, on the appointed day, the relations of the two hoſtile families are aſſembled, and the criminal is introduced, dragging himſelf along on his hands and feet, the muſket, piſtol, or cutlaſs, with which he committed the murder, hung about his neck; and while he continues in that humble poſture, one or more of the relations recites a panegyric on the dead, which ſometimes rekindles the flames of revenge, and puts the poor proſtrate in no ſmall danger. It is the cuſtom in ſome places for the offended party to threaten the criminal, holding all kinds of arms to his throat, and, after much intreaty, to conſent at laſt to accept of his ranſom. Theſe pacifications coſt dear in Albania; but the Morlacchia make up matters ſometimes at a ſmall expence; and every-where the buſineſs is concluded with a feaſt at the offender's charge.

The Morlacks, whether they happen to be of the Roman or of the Greek church, have very ſingular ideas about religion; and the ignorance of their teachers daily augments this monſtrous evil. They are as firmly perſuaded of the reality of witches, fairies, enchantments, nocturnal apparitions, and ſortiliges, as if they had ſeen a thouſand examples of them. Nor do they make the leaſt doubt about the exiſtence of vampires; and attribute to them, as in Tranſylvania, the ſucking the blood of infants. Therefore, when a man dies ſuſpected of becoming a vampire, or *vukodlak*, as they call it, they cut his hams, and prick his whole body with pins; pretending, that after this operation he cannot walk about. There are even inſtances of Morlacchi, who, imagining that they may poſſibly thirſt for childrens blood after death, intreat their heirs, and ſometimes oblige them to promiſe, to treat them as vampires when they die.

The boldeſt Haiduk would fly trembling from the apparation of a ſpectre, ghoſt, phantom, or ſuch like goblins as the heated imaginations of credulous and prepoſſeſſed people never fail to ſee. Nor are they aſhamed, when ridiculed for this terror; but anſwer, much in the words of Pindar; " Fear that proceeds [illegible] cauſes even the [illegible] of the gods to fly." The women, as may be naturally ſuppoſed, are a hundred times more timorous and viſionary than the men, and ſome of them by frequently hearing themſelves called *witches*, actually believe they are ſo.

A moſt perfect diſcord reigns in Morlachia, as it generally does in other parts, between the Latin and Greek communion, which their reſpective prieſts fail not to foment, and tell a thouſand little ſcandalous ſtories of each other. The churches of the Latins are poor, but not very dirty: thoſe of the Greeks are equally poor, and ſhamefully ill kept. Our author has ſeen the curate of a Morlack village ſitting on the ground in the church yard, to hear the confeſſion of women on their knees by his ſide: a ſtrange poſture indeed! but a proof of the innocent manners of thoſe good people, who have the moſt profound veneration for their ſpiritual paſtors, and a total dependence upon them; who, on their part, frequently make uſe of a diſcipline rather military, and correct the bodies of their offending flock with the cudgel. Perhaps this particular is carried to an abuſe as well as that of public penance, which they pretend to inflict after the manner of the ancient church. They moreover, thro' the ſilly credulity of thoſe poor mountaineers, draw illicit profits, by ſelling certain ſuperſtitious ſcrolls and other ſcandalous merchandiſe of that kind. They write in a capricious manner on the ſcrolls called *zapiz*, ſacred names which ought not to be trifled with, and ſometimes adding others very improperly joined. The virtues attributed to theſe zapiz are much of the ſame nature as thoſe which the Baſilians attributed to their monſtrouſly cut ſtones. The Morlacchi uſed to carry them ſewed to their caps, to cure or to prevent diſeaſes; and they alſo tie them for the ſame purpoſe to the horns of their oxen. The compoſers of this trumpery take every method to maintain the credit of their profitable trade, in ſpite of its abſurdity, and the frequent proofs of its inutility. And ſo great has their ſucceſs been, that not only the Morlacchi, but even the Turks near the borders, provide themſelves plentifully with zapiz from the Chriſtian prieſts, which not a little increaſes their income, as well as the reputation of the commodity. The Morlacchi have alſo much devotion, and many of the ignorant people in Italy have little leſs, to certain copper and ſilver coins of the low empire; or to Venetian cotemporary pieces, which paſs among them for medals of St Helen; and they think they cure the epilepſy and ſuch like. They are equally fond of an Hungarian coin called *petizza*, which has the virgin and child on the reverſe; and one of theſe is a moſt acceptable preſent to a Morlack.

The bordering Turks not only keep with devotion the ſuperſtitious zapiz, but frequently bring preſents and cauſe maſſes to be celebrated to the images of the Virgin; which is doubtleſs in contradiction to the alcoran: yet when ſaluted, in the uſual manner in that country, by the name of *Jeſus*, they do not anſwer. Hence, when the Morlacchi, or other travellers, meet them on the confines, they do not ſay, *Huaglian Iſſuſ.* "Jeſus be praiſed;" but, *Huaglian Bog*, "God be praiſed."

Innocence, and the natural liberty of paſtoral ages, are ſtill preſerved among the Morlacchi, or at leaſt many traces of them remain in the places furtheſt diſtant from our ſettlements. Pure cordiality of ſentiment is not there reſtrained by other regards, and diſplays itſelf without any diſtinction of circumſtance. A young handſome Morlack girl, who meets a man of her diſtrict on the road, kiſſes him affectionately, without the leaſt malice or immodeſt thought; and our author has ſeen all the women and girls, all the young men and old, kiſſing one another as they came into the church-yard on a holiday: ſo that they looked as if they had been all belonging to one family. He hath often obſerved the ſame thing on the road, and at the fairs in the maritime towns, where the Morlacchi come to ſell their commodities. In times of feaſting and merriment, beſides the kiſſes, ſome other little liberties are taken with the hands, which we would not reckon decent, but are not minded among them; and when they are told it, they anſwer, It is only toying, and means nothing. From this toying, however, their amours often take their beginning, and frequently end ſeriouſly when the two lovers are once agreed. For it very rarely happens, in places far diſtant from the coaſt, that a Morlack carries off a girl againſt her will, or diſhonours her; and were ſuch attempts made, the young woman would, no doubt, be able to defend herſelf; the women in that country being generally very little leſs robuſt than the men. But the cuſtom is for the woman herſelf to appoint the time and place of being carried off; and ſhe does ſo in order to extricate herſelf from other ſuitors, from whom ſhe may have received ſome love token; ſuch as a braſs ring, a little knife, or ſuch like trifles. The Morlack women keep themſelves ſomewhat neat till they get a huſband; but after marriage they abandon themſelves totally to a loathſome dirtineſs, as if they intended to juſtify the contempt with which they are treated. Indeed it cannot be ſaid that even the young women have a grateful odour, as they are uſed to anoint their hair with butter, which ſoon becoming rancid exhales no agreeable effluvia.

The dreſs of the unmarried women is the moſt complex and whimſical, in reſpect to the ornaments of the head; for when married they are not allowed to wear any thing elſe but a handkerchief, either white or coloured, tied about it. The girls uſe a ſcarlet cap, to which they commonly hang a veil falling down on the ſhoulders, as a mark of their virginity. The better ſort adorn their caps with ſtrings of ſilver coins, among which are frequently ſeen very ancient and valuable ones; they have moreover ear-rings of very curious work, and ſmall ſilver chains with the figures of half moons faſtened to the ends of them. But the poor are forced to content themſelves with plain caps; or if they have any ornaments, they conſiſt only of ſmall exotic ſhells, round glaſs beads, or bits of tin. The principal merit of theſe caps, which conſtitue the good taſte as well as vanity of the Morlack young ladies, is to attract and fix the eyes of all who are near them by the multitude of ornaments, and the noiſe they make on the leaſt motion of their heads. Hence half-moons of ſilver, or of tin, little chains and hearts, falſe ſtones and ſhells, together with all kinds of ſplendid trumpery, are readily admitted into their head dreſs. In ſome diſtricts, they fix tufts of various coloured feathers reſembling two horns on their caps:

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in others, tremulous plumes of glaſs: and in others, artificial-flowers, which they purchaſe in the ſea-port towns; and in the variety of thoſe capricious and barbarous ornaments, ſometimes a fancy not inelegant is diſplayed. Their holiday-ſhifts are embroidered with red ſilk, and ſometimes with gold, which they work themſelves while they attend their flocks; and it is ſurpriſing to ſee how nicely this work is executed.—Both old and young women wear about their necks large ſtrings of round glaſs-beads, of various ſize and colour; and many rings of braſs, tin, or ſilver, on their fingers. Their bracelets are of leather covered with wrought tin or ſilver; and they embroider their ſtomachers, or adorn them with beads or ſhells. But the uſe of ſtays is unknown, nor do they put whalebone or iron in the ſtomacher. A broad woollen girdle ſurrounds their petticoat, which is commonly decked with ſhells, and of blue colour, and therefore called *modrina*. Their gown, as well as petticoat, is of a kind of ſerge; and both reach near to the ankle; the gown is bordered with ſcarlet, and called *ſadak*. They uſe no modrina in ſummer, and only wear the ſadak without ſleeves over a linen petticoat or ſhift.—The girls always wear red ſtockings; and their ſhoes are like thoſe of the men, called *opanke*. The ſole is of undreſſed ox-hide, and the upper part of ſheeps-ſkin thongs knotted, which they call *apute;* and theſe they faſten above the ankles, ſomething like the ancient cothurnus.

The unmarried women, even of the richeſt females, are not permitted to wear any other ſort of ſhoes; though after marriage they may, if they will, lay aſide the opanke, and uſe the Turkiſh ſlippers. The girls keep their hair treſſed under their caps, but when married they let it fall diſhevelled on the breaſt; ſometimes they tie it under the chin; and always have medals, beads, or bored coins, in the Tartar or American mode twiſted amongſt it. An unmarried woman, who falls under the imputation of want of chaſtity, runs the riſk of having her red cap torn off her head publickly in church by the curate, and her hair cut by ſome relation, in token of infamy. Hence, if any of them happen to have fallen into an illicit amour, they commonly of their own accord lay aſide the badge of virginity, and remove into another part of the country,

Nothing is more common among the Morlacchi than marriages concluded between the old people of the reſpective families, eſpecially when the parties live at a great diſtance and neither ſee nor know each other: and the ordinary motive of theſe alliances is the ambition of being related to a numerous and powerful family, famous for having produced valiant men. The father of the future bridegroom, or ſome other near relation of mature age, goes to aſk the young woman, or rather a young woman of ſuch a family, not having commonly any determinate choice. Upon this all the girls of the houſe are ſhown to him, and he chooſes which pleaſes him beſt, though generally reſpecting the right of ſeniority. A denial in ſuch caſes is very rare; nor does the father of the maid inquire much into the circumſtances of the family that aſks her. Sometimes a daughter of the maſter is given in marriage to the ſervant or tenant, as was uſual in patriarchal times; ſo little are the women regarded in this country. On theſe occaſions, however, the Morlacchi girls enjoy a privilege which ours would alſo wiſh to have, as in juſtice they certainly ought. For he who acts by proxy, having obtained his ſuit, is obliged to go and bring the bridegroom; and if, on ſeeing each other, the young people are reciprocally content, the marriage is concluded, but not otherwiſe. In ſome parts it is the cuſtom for the bride to go to ſee the houſe and family of the propoſed huſband, before ſhe gives a definitive anſwer; and if the place or perſons are diſagreeable to her, ſhe is at liberty to annul the contract. But if ſhe is contented, ſhe returns to her father's houſe, eſcorted by the bridegroom and neareſt relations. There the marriage day is appointed: on which the bridegroom comes to the bride's houſe, attended by all his friends, of greateſt note, who on this occaſion are called *ſvati*, and are all armed, and on horſeback, in their holiday-cloaths with a peacock's feather in their cap, which is the diſtinctive ornament uſed by thoſe who are invited to weddings. The company goes armed, to repulſe any attack or ambuſh that might be intended to diſturb the feaſt; for in old times theſe encounters were not unfrequent according to the records of many national heroic ſongs.

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The bride is conducted to a church veiled, and ſurrounded by the ſvati on horſeback: and the ſacred ceremony is performed amidſt the noiſe of muſkets, piſtols, barbaric ſhouts and acclamations, which continue till ſhe returns to her father's houſe, or to that of her huſband, if not far off. Each of the ſvati has his particular inſpection, as well during the cavalcade as at the marriage-feaſt, which begins immediately on their return from church. The parvinaz precedes all the reſt, ſinging ſuch ſongs as he thinks ſuitable to the occaſion. The bariactar brandiſhes a lance with a ſilken banner faſtened to it, and an apple ſtuck on the point; there are two bariactars, and ſometimes four at the more noble marriages. The ſtari-ſvat is the principal perſonage of the brigade; and the moſt reſpectable relation is commonly inveſted with this dignity. The ſtacheo's duty is to receive and obey the orders of the ſtari-ſvat. The two diveri, who ought to be the bridegroom's brothers when he has any, are appointed to ſerve the bride. The knum correſponds to our ſponſors; and the komorgia, or ſekſana, is deputed to receive and guard the dowry. A ciaous carries the mace, and attends to the order of the march, as maſter of the ceremonies; he goes ſinging aloud, *Breberi, Davori, Dobraſrichio, Jari, Pico*; names of ancient propitious deities. Buklia is the cup-bearer of the company, as well on the march as at table: and all theſe offices are doubled, and ſometimes tripled; in proportion to the number of the company.

The firſt day's entertainment is ſometimes made at the bride's houſe, but generally at the bridegroom's, whither the ſvati haſten immediately after the nuptial benediction: and at the ſame time three or four men run on foot to tell the good news; the firſt who gets to the houſe has a kind of towel, embroidered at the ends, as a premium. The domachin, or head of the houſe, comes out to meet his daughter in-law; and a child is handed to her, before ſhe alights, to careſs it; and if there happens to be none in the houſe, the child is borrowed from one of the neighbours. When ſhe alights, ſhe kneels down, and kiſſes the threſhold.—then the mother-in-law, or in her place ſome other female relation, preſents a corn-ſieve, full of different kinds of grain, nuts, almonds, and other ſmall fruit, which the bride ſcatters upon the ſvati, by handfuls, behind her back. The bride does not ſit at the great table the firſt day, but has one apart for herſelf, the two diveri, and the ſtacheo. The bridegroom ſits at table with the ſvati; but in all that day, conſecrated to the matrimonial union, he muſt neither unloofen or cut any thing whatever. The knum carves his meat, and cuts his bread. It is the domachin's buſineſs to give the toaſts; and the ſtari-ſvat is the firſt who pledges him. Generally the bukkara, a very large wooden cup, goes round, firſt to the ſaint protector of the family; next to the proſperity of the holy faith; and ſometimes to a name the moſt ſublime and venerable. The moſt extravagant abundance reigns at theſe feaſts; and each of the ſvati contributes, by ſending a ſhare of proviſions. The dinner begins with fruit and cheeſe; and the ſoup comes laſt, juſt contrary to our cuſtom. All ſorts of domeſtic fowls, kid, lamb, and ſometimes veniſon, are heaped in prodigal quantities upon their tables; but very rarely a Morlacco eats veal, and perhaps never, unleſs he has been perſuaded to do it out of his own country. This abhorrence to calves fleſh is very ancient among the Morlacchi. St Jerom, againſt Jovinian, takes notice of it; and Tomeo Marnavich, a Boſnian writer, who lived in the beginning of the laſt age, ſays, that the Dalmatians, uncorrupted by the vice of ſtrangers, abſtained from eating calves fleſh as an unclean food, even to his days. The women relations, if they are invited, never dine at table with the men, it being an eſtabliſhed cuſtom for them to dine by themſelves. After dinner, they paſs the reſt of the day in dancing, ſinging ancient ſongs, and in games of dexterity, or of wit and fancy; and in the evening, at a convenient hour after ſupper, the three ritual healths having firſt gone round, the knum accompanies the bridegroom to the matrimonial apartment, which commonly is the cellar or the ſtable, whither the bride is alſo conducted by the diveri and the ſtacheo; but the three laſt are obliged to retire, and the knum remains alone with the new-married couple. If there happens to be any bed prepared better than ſtraw, he leads them to it: and having untied the bride's girdle, he cauſes them both to undreſs each other reciprocally. It is not long ſince the knum was obliged to undreſs the bride entirely; but that cuſtom is now out of uſe; and, inſtead of it, he has the privilege of kiſſing her as often as he pleaſes, wherever he meets her; which privilege may poſſibly be agreeable for the firſt months, but muſt ſoon become very diſguſtful. When they are both undreſſed, the knum retires, and ſtands liſtening at the door, if there be a door. It is his buſineſs to announce the conſummation of the marriage, which he does by diſcharging a piſtol, which is anſwered by many of the company. The next day the bride, without her veil and virginal cap, dines at table with the ſvati, and is forced to hear the coarſe equivocal jeſts of her indelicate and ſometimes intoxicated company.

Theſe nuptial-feaſts, called *ſdrave* by the ancient Huns, are by our Morlacchi called *ſdravize*, from whence our Italian word *ſtravizzo* is undoubtedly derived. They continue three, ſix, eight, or more days, according to the ability or prodigal diſpoſition of the family where they are held. The new-married wife gets no inconſiderable profit in theſe days of joy; and it uſually amounts to much more than all the portion ſhe brings with her, which often conſiſts of nothing but her own clothes and perhaps a cow; nay, it happens ſometimes that the parents, inſtead of giving money with the daughter, get ſomething from the bridegroom by way of price. The bride carries water every morning to waſh the hands of her gueſts as long as the feaſting laſts; and each of them throws a ſmall piece of money into the baſon after performing that function, which is a very rare one among them, excepting on ſuch occaſions. The brides are alſo permitted to raiſe other little contributions among the ſvati, by hiding their ſhoes, caps, knives, or ſome other neceſſary part of their equipage, which they are obliged to ranſom by a piece of money, according as the company rates it. And, beſides all theſe voluntary or extorted contributions already mentioned, each gueſt muſt give ſome preſent to the new married wife at taking leave the laſt day of the ſdraviſe: and then ſhe alſo diſtributes ſome trifles in return, which commonly conſiſt in ſhirts, caps, handkerchiefs, and ſuch like.

The nuptial-rites are almoſt preciſely the ſame thro' all the vaſt country inhabited by the Morlacchi; and thoſe in uſe among the peaſants and common people of the ſea-coaſt of Dalmatia, Iſtria, and the iſlands, differ but little from them. Yet among theſe particular varieties, there is one of the iſland Zlarine, near Sebenico, remarkable enough; for there the ſtariſvat (who may naturally be ſuppoſed drunk at that hour) muſt at one blow with his naked broad ſword, ſtrike the bride's crown of flowers off her head, when ſhe is ready to go to bed. And in the iſland of Pago, in the village of Novoglia (probably the Giſſa of ancient Geographers) there is a cuſtom more comical, and leſs dangerous, but equally ſavage and brutal. After the marriage contract is ſettled, and the bridegroom comes to conduct his bride to church, her father or mother, in delivering her over to him, makes an exaggerated enumeration of her ill qualities: " Know, ſince thou wilt have her, that ſhe is good for nothing, ill-natured, obſtinate, &c." On which the bridegroom, affecting an angry look, turns to the young woman, with an " Ah! ſince it is ſo, I will teach you to behave better:" and at the ſame time regales her with a blow or a kick, or ſome piece of ſimilar galantry, which is by no means figurative. And it ſeems in general, that the Morlack women, and perhaps the greateſt part of the Dalmatians, the inhabitants of the cities excepted, do not diſlike a beating either from their huſbands or lovers.

In the neighbourhood of Derniſh, the women are obliged, during the firſt year after marriage, to kiſs all their national acquaintances who come to the houſe; but after the firſt year they are diſpenſed from that compliment: and indeed they become ſo intolerably naſty, that they are no longer fit to practice it. Perhaps the mortifying manner in which they are treated by their huſbands and relations is, at the ſame time, Morlachia, Morley.

both the cauſe and effect of their ſhameful neglect of their perſons. When a Morlack huſband mentions his wife, he always premiſes, by your leave, or begging your pardon. And when the huſband has a bedſtead, the wife muſt ſleep on the floor near it. Our author often lodged in Morlack houſes, and obſerved that the female ſex is univerſally treated with contempt; it is true, that the women are by no means amiable in that country; they even deform and ſpoil the gifts of nature.

The pregnancy and births of thoſe women would be thought very extraordinary among us, where the ladies ſuffer ſo much, notwithſtanding all the care and circumſpection uſed before and after labour. On the contrary, a Morlack woman neither changes her food nor interrupts her daily fatigue on account of her pregnancy; and is frequently delivered in the fields, or on the road, by herſelf; and takes the infant, waſhes it in the firſt water ſhe finds, carries it home and returns the day after to her uſual labour, or to feed her flock.

The little creatures, thus careleſsly treated in their tendereſt moments, are afterwards wrapt in miſerable rags, where they remain three or four months, under the ſame ungentle management: and when that term is elapſed, they are ſet at liberty, and left to crawl about the cottage and before the door, till they learn to walk upright by themſelves; and at the ſame time acquire that ſingular degree of ſtrength and health with which the Morlacchi are endowed, and are able, without the leaſt inconvenience, to expoſe their naked breaſts to the ſevereſt froſt and ſnow. The infants are allowed to ſuck their mother's milk while ſhe has any, or till ſhe is with child again; and if that ſhould not happen for three, four, or ſix years, they continue all that time to receive nouriſhment from the breaſt. The prodigious length of the breaſts of the Morlacchian women is ſomewhat extraordinary; for it is very certain, that they can give the teat to their children over their ſhoulders, or under their arms. They let the boys run about, without breeches, in a ſhirt that reaches only to the knee, till the age of 13 or 14, following the cuſtom of Boſſnia, ſubject to the Porte, where no haraz or capitation-tax is paid for the boys till they wear breeches, they being conſidered before that time as children, not capable of labouring, or of earning their bread. On the occaſion of births, and eſpecially of the firſt, all the relations and friends ſend preſents of eatables to the woman in childbed, or rather to the woman delivered; and the family makes a ſupper of all thoſe preſents together. The women do not enter the church till 40 days after child-birth.

The Morlacchi paſs their youth in the woods, attending their flocks and herds; and in that life of quiet and leiſure they often become dexterous in carving with a ſimple knife; they make wooden cups, and whiſtles adorned with fanciful baſſe-reliefs, which are not void of merit, and at leaſt ſhow the genius of the people.

MORLEY (George), biſhop of Wincheſter, was the ſon of Francis Morley, Eſq; and was born at London in 1597. He was educated at Chriſt church, Oxford, of which he had the canonry in 1641, and the next year was made doctor of divinity. He had alſo ſeveral church preferments, of which he was deprived by the parliament viſitors in the beginning of the year 1648. After this, king Charles I. ſent for him to aſſiſt at the treaty of the Iſle of Wight. After the king's death he attended the lord Capel at his execution, and then retired to Charles II. at the Hague, on whom he conſtantly waited till his majeſty went to Scotland, when he retired to Antwerp, where he read the ſervice of the church of England, as he afterwards did at Breda. At the Reſtoration he was firſt made dean of Chriſt-church, and in 1660 was conſecrated biſhop of Worceſter, and ſoon after was made dean of the royal chapel. In 1662 he was tranſlated to the biſhopric of Wincheſter, when he beſtowed conſiderable ſums on that ſee, in repairing Farnham-caſtle and his palace at Weſtminſter, and in purchaſing Wincheſter houſe at Chelſea. He died at Farnham-caſtle in 1684. He was a Calviniſt, and before the wars was thought a friend to the Puritans; but after his promotion he took care to free himſelf from all ſuſpicions of that kind. He was a pious and charitable man, of a very exemplary life, but extremely paſſionate. He publiſhed, 1. *Epiſtola apologetica et paranetica ad theologum quendam Belgam ſcripta*, in 4to, 2. The ſum of a ſhort conference between Father Darcey a Jeſuit and Dr Morley at Bruſſels. 3. An argument drawn from the evidence and certainty of ſenſe againſt the doctrine of Tranſubſtantiation. 4. A letter to Anne ducheſs of York. 5. Several ſermons, and other pieces.

Mornay.

MORNAY (Philippe de), ſeigneur du Pleſſis-Marly, was born at Buhy or Biſhuy in Upper Normandy, November 5th, 1549, and educated at Paris. What was then thought a prodigy in a gentleman, he made a rapid progreſs in the belles lettres, in the learned languages, and in theology. He was at firſt deſtined for the church; but the principles of Calviniſm, which he had imbibed from his mother, effectually excluded him from the eccleſiaſtical preferments to which he was entitled by his intereſt, abilities, and birth. After the horrible maſſacre of St Bartholomew, Philippe de Mornay made the tour of Italy, Germany, England, and the Low Countries; and he was equally improved and delighted by his travels. Mornay afterwards joined the king of Navarre, at that time leader of the Proteſtant party, and ſo well known ſince by the name of Henry IV. This prince ſent Mornay, who employed his whole abilities, both as a ſoldier and a writer, in defence of the Proteſtant cauſe, to conduct a negociation with Eliſabeth queen of England; and left him wholly to his own diſcretion in the management of that buſineſs. He was ſucceſsful in almoſt every negociation, becauſe he conducted them like an able politician, and not with a ſpirit of intrigue. He tenderly loved Henry IV. and ſpoke to him on all occaſions as to a friend. When he was wounded at Aumale, he wrote to him in theſe words: "Sire, you have long enough acted the part of Alexander, it is now time you ſhould act that of Cæſar. It is your duty to die for your majeſty, &c. It is glorious for you, Sire, and I dare venture to tell you it is your duty, to live for us." This faithful ſubject did every thing in his power to raiſe Henry to the throne. But when he deſerted the Proteſtant faith, he reproached him in the bittereſt manner, and

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retired from court. Henry ſtill loved him; and was extremely affected with an inſult which he received in 1597 from one Saint-Phal, who beat him with a cudgel, and left him for dead. Mornay demanded juſtice from the king; who gave him the following anſwer, a proof as well of his ſpirit as of his goodneſs of heart. "Monſieur Dupleſſis, I am exceedingly offended at the inſult you have received; and I ſympathize with you both as your ſovereign and your friend. In the former capacity, I ſhall do juſtice to you and to myſelf; and had I ſuſtained only the character of your friend, there are few perhaps who would have drawn their ſword or ſacrificed their life more cheerfully in your cauſe. Be ſatisfied, then, that I will act the part of a king, a maſter, and a friend, &c." Mornay's knowledge, probity, and valour, made him the ſoul of the Proteſtant party, and procured him the contemptuous appellation of the *Pope of the Huguenots.* He defended their doctrines both by ſpeech and writing. One of his books on the Iniquity of the Maſs, having ſtirred up all the Catholic divines, he refuſed to make any reply to their cenſures and criticiſms except in a public conference. This was accordingly appointed to be held A. D. 1600, at Fountainbleau, where the court then was. The two champions were, du Perron biſhop of Evreux, and Mornay. After a great many arguments and replies on both ſides, the victory was adjuged to du Perron. He had boaſted that he would point out to the ſatisfaction of every one five hundred errors in his adverſary's book, and he partly kept his word. The Calviniſts did not fail to claim the victory on this occaſion, and they ſtill continue to do ſo. This conference, inſtead of putting an end to the differences, was productive of new quarrels amongſt the controverſialiſts, and of much profane wit among the libertines. A Huguenot miniſter, who was preſent at the conference, obſerved with great concern to a captain of the ſame party,—"The biſhop of Evreux has already driven Mornay from ſeveral ſtrong holds." "No matter (replied the ſoldier), provided he does not drive him from Saumur." This was an important place on the river Loire, of which Dupleſſis was governor. Hither he retired, his attention being conſtantly occupied in defending the Huguenots, and in making himſelf formidable to the Catholics. When Louis XIII. was making preparations againſt the Proteſtants, Dupleſſis wrote him a letter, diſſuading him againſt ſuch a meaſure. After employing the moſt plauſible arguments, he concludes in the following manner: "To make war on the ſubject, is an indication of weakneſs in the government. Authority conſiſts in the quiet ſubmiſſion of the people, and is eſtabliſhed by the prudence and juſtice of the governor. Force of arms ought never to be employed except in repelling a foreign enemy. The late king would have ſent the new miniſters of ſtate to learn the firſt elements of politics, who like unſkilful ſurgeons would apply violent remedies to every diſeaſe, and adviſe a man to cut off an arm when his finger aches." Theſe remonſtrances produced no other effect than the loſs of the government of Saumur, of which he was deprived by Louis XIII. in 1621. He died two years after, November 11th, 1623, aged 74, in his barony *de la Foret-ſur-Seure* in Poitou. The Proteſtant cauſe never had an abler ſupporter, or one who did it more credit by his virtues and abilities.

Cenſeur des courtiſans, mais à la cour aimé ;
Fier ennemi de Rome, et de Rome eſtimé. HENRIADE.

The following is a liſt of his works: 1. *Un Traité de l'Euchariſte,* 1604, in folio. 2. *Un Traité de la verité de la Religion Chretienne,* 8vo. 3. A book entitled *La Myſtere d'iniquité,* 4to. 4. *Un diſcours ſur le droit pretendu par ceux de la maiſon de Guiſe,* 8vo. 5. Curious and intereſting *Memoirs* from the year 1572 to 1629, 4 vols 4to. valuable. 6. *Letters;* which are written with great ſpirit and good ſenſe. David des Liques has given us his life in quarto; a book more intereſting for the matter than the manner.

Morne-garou.

MORNE-GAROU, a very remarkable volcanic mountain on the iſland of St Vincent's in the Weſt Indies. It was viſited by Mr James Anderſon ſurgeon in the year 1784, who is the only perſon that ever aſcended to the top of it, and from whoſe account, in the Philoſophical Tranſactions, Vol. LXXV. the following is taken.

The mountain in queſtion is ſituated on the north-weſt part of the iſland, and is the higheſt in it. It is conſtantly reported to have emitted volcanic eruptions; and the ravins at the bottom ſeem to corroborate the traditions of the inhabitants in this reſpect. The ſtructure of it, when viewed at a diſtance, appears different from that of any other mountain in the iſland, or that Mr Anderſon had ſeen in the Weſt Indies. He could perceive it divided into many different ridges, ſeparated by deep chaſms, and its ſummit appeared quite deſtitute of every vegetable production. Several ravins, that run from the bottom a great way up the mountain, were found quite deſtitute of water, and pieces of pumice-ſtone, charcoal, and ſeveral earths and minerals of a particular quality, found in them, plainly indicated ſome very great ſingularity in this mountain. Some very old men alſo informed our author, that they had heard it related by the captain of a ſhip, that between this iſland and St Lucia he ſaw flames and ſmoke riſing from the top of the mountain, and next morning his decks were covered with aſhes and ſmall ſtones.

Mr Anderſon's curioſity was ſo much excited by theſe circumſtances, that he formed a reſolution of going up to the top; but was informed that this was impoſſible, nor could he find either white man, Caribbee, or negro, who would undertake to ſhow him the way. Having obſerved the baſis as well as he could, with a view to diſcover the moſt proper place for attempting an aſcent, he found ſeveral dry ravins that ſeemingly ran a great way up, though he could not be certain that they were not interſected by rocks or precipices lying acroſs. Having examined the mountain with a good glaſs, he thought he perceived two ridges by which there was a poſſibility of getting up; and though they appeared to be covered for a great way with wood, he hoped by a little cutting to open a way through it.

On the 26th of February 1784, our author began his journey, having been furniſhed by a Mr Maloune, who lives within a mile of the foot of the mountain, with two ſtout negroes, and having another boy who waited on himſelf. They arrived at the bottom of

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the mountain a little before ſeven in the morning, having each a good cutlaſs to cut through the woods, or to defend themſelves in caſe of an attack from the Caribbees or runaway negroes. Before they could get at either of the ridges, however, they had a rock to climb upwards of 40 feet high. Having ſcrambled up this with great difficulty, they found themſelves in the bottom of a deep and narrow ravin, which having aſcended a little way, they arrived at the habitation of Mr Gaſco a Frenchman. Mr Anderſon expreſſes his ſurpriſe, that a young and healthy man, and a good mechanic, ſhould ſequeſtrate himſelf from the world among woods and precipices, where he was beſides in continual danger of being ſwept away with his whole habitation by the torrents occaſioned by the rains. He found him, however, an intelligent man, and was hoſpitably entertained by him.

"The difficulty (ſays Mr Anderſon) in going thro' woods in the Weſt Indies, where there are no roads or paths, is far beyond any thing an European can conceive. Beſides tall trees and thick underwood, there are hundreds of different climbing plants twiſted together like ropes, and running together in all directions to a great extent, and even to the tops of the higheſt trees. They cannot be broken by puſhing on; and many of them are not to be cut without difficulty. Beſides theſe, a ſpecies of graſs, the *ſchœnus lithoſpermos*, with ſerrated leaves, cuts and tears the hands and face terribly."

By reaſon of theſe obſtructions, it was upwards of two hours before they got upon the ridge; but here they found their paſſage more difficult than before. They were now ſurrounded by a thick foreſt, rendered more impracticable by the large piles of trees blown down by the hurricanes; which obliged them in many places to creep on their hands and feet to get below them, while in others it was neceſſary to climb to a conſiderable height to get over them; at the ſame time that by the trunks being frequently rotten, they often tumbled headlong from a great height, and could not extricate themſelves without great difficulty.

The fatigue of cutting their way through the woods ſoon became intolerable to the negroes; ſo that about four in the afternoon he could not prevail on them to go any farther. Mr Anderſon therefore perceiving it was impoſſible to get to the ſummit that night, and his water being totally expended, returned to Mr Gaſco's, where he ſpent the night, determining to try another route next morning. The hoſpital Frenchman entertained him in the beſt manner he could; but though he parted with his own hammock to him, and ſlept on a board himſelf, Mr Anderſon found it impoſſible to ſhut his eyes the whole night by reaſon of the cold. "His hut (ſays he) was built of *roſeaux* or large reeds, between each two of which a dog might creep through, and the top was covered with dry graſs. It is ſituated in the bottom of a deep gully, where the ſun does not ſhine till nine in the morning nor after four in the afternoon. It is ſurrounded by thick wood; and during the night the whole of the mountain is covered with thick clouds, from which it frequently rains, and which makes the night air exceedingly cold."

Early next morning Mr Anderſon ſet out in company with the negro boy, who continued very faithful to him during the whole of the journey. He now determined to take his courſe up the ravin, and proceeded for about a mile and a half without any conſiderable obſtruction. It now, however, began to narrow faſt: there were numbers of rocks and precipices to climb over, with many buſhes and vines, which could ſcarcely be got through. At laſt the ravin terminated at the bottom of a very high precipice. It was impoſſible to know the extent of this, as the top was covered with thick wood; but from the bottom upward, as far as he could ſee, was looſe ſand with ferns and tufts of graſs, which as ſoon as he took hold of them came up by the roots. Though the aſcent was plainly at the riſk of his life, Mr Anderſon reſolved to attempt it; and therefore telling the boy to keep at ſome diſtance behind, leſt he ſhould tumble and drive him down, he began to aſcend, digging holes with his cutlaſs to put his feet in, and taking hold of the tufts of graſs as lightly as poſſible. Notwithſtanding all his care, however, he frequently ſlipped down a conſiderable way; but as it was only looſe ſand, he could eaſily puſh his cutlaſs into it up to the handle, and thus by taking hold of it recover himſelf again. At laſt he got up to ſome wild plantains, which continued all the way to the place where the trees began to grow. Here he reſted for ſome time, waiting for the boy, who got up with much leſs difficulty than he had done. On getting up to the top of the precipice, he found himſelf on a very narrow ridge, covered with wood, and bounded by two ravins, the bottoms of which he could not ſee, the deſcent to them appearing to be nearly perpendicular, though all the way covered with thick wood. Proceeding onwards, they found the ridge exceedingly narrow, in many places not ſix feet broad; with a tremendous gulf on each ſide, into which they were every moment in danger of falling; ſo that Mr Anderſon was obliged to lie down on his belly with great caution, in order to ſee through the buſhes how the ridge tended.

Here a ſulphureous ſmell, or rather one like gunpowder, began to be perceived; which, Mr Anderſon knew, muſt proceed from the top of the mountain, as the wind then blew that way; and as it plainly grew ſtronger as he advanced, he was in hopes that the top could not be very far diſtant. Perceiving a riſing before him, he imagined, that, by getting upon it, he might have a view of the top of the mountain; but when this was done, he could only ſee a peak on the north-weſt ſide of the mountain, to which, by appearance, he judged himſelf very little nearer than when at the bottom.

The woods now became very difficult, great quantities of fallen trees lying buried among the graſs; and being rotten, he was frequently buried very deep among them when he thought himſelf walking upon firm ground. About noon he was alarmed with a ruſtling among the buſhes, and ſomething like a human voice behind him; but as he was preparing to defend himſelf againſt Carribbees or run-away negroes, he was agreeably ſurpriſed with the ſight of thoſe who had formerly left him, with three others, ſent by Mr Maloune with plenty of proviſions. Encouraged by this aſſiſtance, after refreſhing themſelves, they renewed their labours with freſh vigour, and Mr Anderſon thought himſelf ſure of reaching the top before night.

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In a little time he had a fair view of the ravin on the left, which was of prodigious depth, and ran from near the top of the mountain to the ſea. Its bottom ſeemed to be a rock nearly reſembling lava in colour, and it ſeemed as if there had been vaſt torrents of ſulphureous matter running upon it for ſome time.—He now regretted much that he knew not of this ravin before he commenced his excurſion, as, by paſſing a headland in a canoe, and getting into it, he might have gained the ſummit without all thoſe delays and difficulties he had encountered.

About four in the afternoon he had no proſpect of the top of the mountain, but imagined that if he could get into the ravine before night, he might eaſily reach it next morning. After cutting through wild plantains for a great way, however, he found himſelf at ſunſet on the brink of a precipice, over which he prevented himſelf from falling by catching hold of ſome ſhrubs. They were now about half way down, but all the reſt of the way ſeemed a perpendicular precipice, which it was impoſſible to paſs; the top of the mountain was yet a great way off, and there was no other reſource than to attempt the ridge they had left. The evening was now ſo far advanced, that they were obliged to take up their reſidence where they were; and there was only time to place two or three ſticks againſt the ſtump of a tree, and ſlightly to cover them with plantain leaves for a night's habitation.—Their ſituation, however, was extremely uncomfortable: it began to rain and blow violently, which prevented them from getting a fire made, ſo that they were almoſt chilled with cold. As ſoon as they could ſee, they renewed their work with great alacrity, and in a ſhort time had the ſatisfaction to perceive that the woods became thin. About eleven o'clock they obtained a full view of the top, about a mile diſtant. It ſeemed to be compoſed of ſix or ſeven ridges, very much broken in the ſides, as if they had ſuffered great convulſions; and they were divided by exceſſively deep ravins without any water in them. Mr Anderſon directed his courſe towards a high peak that overlooked a large excavation where the ridges met, and which he ſuppoſed to be the crater of the volcano. In his way, he found the laſt wood compoſed of a moſt beautiful ſpecies of trees. After that he entered into a thick long graſs intermixed with fern, which branched and ran in every direction. Thro' this they were obliged to cut their way with almoſt as much difficulty as they had done through the woods, and it ſeemed to continue very near to the top of the mountain. The fatigue of this work ſoon reduced them to ſuch a ſituation, that they were ſcarce able to ſtand; and they were obliged to quench their thirſt, which was exceſſive, by chewing the leaves of the begonia obliqua, there being no water to be had in the place. Two of the negroes returned, and the reſt refuſed to proceed any farther; ſo that Mr Anderſon himſelf was obliged to abandon the enterpriſe, and they all began to deſcend about half an hour after twelve; and as there was now a clear path all the way down, they arrived at Mr Gaſco's by ſunſet; and notwithſtanding his extreme wearineſs, Mr Anderſon continued his journey to Mr Maloune's, where he arrived between ſix and ſeven at night.

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Our traveller having refreſhed himſelf to the 4th of March, in order to ſuſtain the fatigues of his journey the better, ſet out about four that morning in company with a Mr Fraſer, who had reſolved to accompany him. They met with little difficulty till they came to the place whence they had formerly returned. Here, however, they were obliged for a quarter of a mile to cut their way through the graſs and ferns already mentioned; which being done, they met with no further obſtruction. When they came within a quarter of a mile of the top, they found the climate ſuddenly altered, the air very cold, and the vegetable productions changed, the whole ſummit of the mountain being barren. On the confines of the graſſy and barren regions, however, he found ſome beautiful plants; and he obſerves, that this is the only place in the Weſt Indies where he ever found moſs: but here it grows in ſuch plenty, that he frequently ſunk in it up to the knees. About noon they reached the ſummit, and were inſtantly ſurpriſed with the ſight of a moſt extraordinary cavity. It is ſituated in the very centre of the mountain, at the place where all the ridges meet. Its diameter is ſomething more than a mile, and its circumference to appearance a perfect circle. Its depth from the ſurrounding margin is above a quarter of a mile, and it narrows a little, but very regularly, to the bottom. Its ſides are very ſmooth, and for the moſt part covered with ſhort moſs, except towards the ſouth, where there are a number of ſmall holes and rents. This is the only place where it is poſſible to go down to the bottom; and the deſcent is very dangerous on account of the numberleſs ſmall chaſms. On the weſt ſide is a ſection of a red rock like granite, cut very ſmooth, and having the ſame declivity with the other parts. All the reſt of the ſurrounding ſides ſeem to be compoſed of ſand, which has undergone the action of an intenſe fire. It has a cruſt quite ſmooth, and about an inch thick, almoſt as hard as rock; on breaking thro' which we met with nothing but looſe ſand. In the centre ſtands a burning mountain about a mile in circumference, of a conic form, "but quite level." Out of the middle of the ſummit riſes a ſmall eminence eight or ten feet high, and perfectly conical; from the apex of which a column of ſmoke conſtantly iſſues. It is compoſed of large maſſes of red granite-like rock, of various ſhapes and ſizes, which appear to have been ſplit into their preſent form by ſome terrible convulſion of nature; and are piled up very regular. Great quantities of ſmoke iſſue from moſt parts of the mountain, eſpecially on the north ſide, which appears to be burning from top to bottom; and the heat is ſo intenſe, that it is impoſſible to aſcend it. It is even very dangerous to go round the baſe, as large maſſes of rock are conſtantly ſplitting with the heat and tumbling down. At the bottom, on the north ſide, is a very large rock ſplit in two. Each of theſe halves, which are rent in all directions, are ſeparated to a conſiderable diſtance from each other, and the crevices have gloſſy effloreſcences taſting like vitriol. There are alſo beautiful cryſtalliſations of ſulphur; and on all parts of the mountain are great quantities of ſulphur, alſo alum, vitriol, &c.

From the external appearance of this mountain, Mr Anderſon conjectures that it had but lately begun to burn; as on ſeveral parts of it he ſaw ſmall ſhrubs

Moroc.

Moroc. Morning.

and graſs which looked as if they had been but lately ſcorched and burnt. There were alſo ſeveral holes on the ſouth from which ſmoke iſſued, that appeared to have broken out but lately, the adjacent buſhes being but lately burnt. On two oppoſite ſides, the eaſt and weſt, of the burning mountain, are two lakes of water, about a ſtone's throw in breadth. They appear to be deep in the middle, and have a bottom of a kind of clay. The water is a chalybeate, and has a pleaſant taſte. Theſe lakes probably derive their exiſtence in a great meaſure, if not totally, from the rain-water running down the ſides of the crater. On the north ſide Mr Anderſon obſerved the traces of great torrents, that to appearance had conveyed vaſt quantities of water to theſe lakes; and by the ſtones at the bottom he could perceive that abſorption or evaporation, or both, went on very faſt. The greater part of the bottom of the crater is very level; and on the ſouth ſide are ſome ſhrubs and ſmall trees. Some pieces of pumice-ſtone were met with, and many ſtones about the ſize of a man's fiſt, rough, and blue upon one ſide, are ſcattered all over the mountain.

The motion of the clouds, on the top of this mountain was very ſingular. Though there were ſeveral parts higher than the crater, yet the clouds ſeemed always to be attracted by the latter. After entering on its eaſt or windward ſide, they ſunk a conſiderable way into it; then mounting the oppoſite ſide, and whirling round the north-weſt ſide, they ran along a ridge which tended nearly north-eaſt, and afterwards ſunk into a deep ravin dividing this ridge from another on the north-weſt corner of the mountain, and the higheſt on it, lying in a direction nearly north and ſouth. They keep in this ridge to the ſouth end, and then whirl off in their natural direction.

From the ſituation of theſe iſlands to one another, and to the continent of South America, Mr Anderſon conjectures, that there are ſubmarine communications between the volcanoes in each of them, and from them to thoſe in the high mountains of South America. He obſerves, that the crater in this iſland lies nearly in a line with Soufriere in St Lucia and Morne Pelee in Martinico; and probably from thence to a place of the ſame kind in Dominique, and from thence to the other iſlands; there being ſomething of the kind in each, Barbadoes and Tobago excepted.

MOROC, or Maroc, a beautiful bird of Abyſſinia deſcribed by Mr Bruce, who thinks its name is derived from *mar* "honey," though he ſays that he never heard it was further concerned in the honey than deſtroying bees. It ſeems to purſue thoſe inſects out of enmity or diverſion as well as for food, leaving great numbers dead on the ground, beſides thoſe which it devours for food. In conſequence of this property, the maroc is never found any where but in thoſe parts where the honey is very plentiful, tho' the Abyſſinians never take any notice of the ravages they commit among their ſtocks of bees.

The moroc reſembles the cuckoo in ſize and ſhape, but differs in other reſpects. Its mouth is very wide, the opening reaching almoſt to his eyes; the inſide of the mouth and throat yellow, the tongue ſharp-pointed, and capable of being drawn almoſt half its length out of the mouth beyond the point of its beak, and is very flexible. The head and neck are brown, without any mixture of other colours; there are likewiſe a number of very ſmall and ſcarcely viſible hairs at the root of the beak. The eyebrows are black; the beak pointed, and very little crooked; the pupil of the eye black, and ſurrounded with an iris of a dull and duſky red: The fore-part of the neck is light yellow, darker on each ſide than in the middle, where it is partly white; the yellow on each ſide reaches near the ſhoulder, or round part of the wing; and from this the whole breaſt and belly is of a dirty white to the under part of the tail; and from this the feathers begin to be tipt with white, as are all thoſe that cover the outſide of the wing. The wing has eight feathers of the largeſt ſize and ſix of the ſecond: the tail conſiſts of twelve feathers, the longeſt three being in the middle: they are placed cloſely together; and the tail is of an equal breadth from top to bottom, the feathers being alſo tipt with white. The thighs are covered with feathers of the ſame colour as theſe of the belly, reaching more than half way down the legs, which are black, as well as the feet, and marked diſtinctly with ſcales. There are two toes before and behind, each of which has a ſharp and crooked claw. It makes a ſharp ſnapping noiſe when it catches the bees, evidently from cloſing its beak; but Mr Bruce never could diſcover that it had any ſong.

This ſeems to be the creature mentioned by Dr Sparman under the name of *cuculus indicator*, which (he ſays) has the ſingular property of diſcovering the neſts of wild bees, and leading travellers by a certain cry to the place where the treaſure is depoſited. According to Sparman's account, it makes known theſe diſcoveries by the ſame cry to foxes as well as to the human ſpecies; but Jerome Lobo, who mentions the Abyſſinian bird, does not take notice of the foxes, though he mentions its ſinging melodiouſly when it arrives at the place where the honey is depoſited. Both theſe accounts are ſeverely criticiſed by Mr Bruce, "I cannot (ſays he), for my own part, conceive, in a country where there are ſo many thouſand hives, that there was any uſe for giving to a bird a peculiar inſtinct or faculty of diſcovering honey, when, at the ſame time, nature had deprived him of the power of availing himſelf of any advantage from the diſcovery: for man ſeems in this caſe to be made for the ſervice of the moroc, which is very different from the common and ordinary courſe of things; man certainly needs him not, for on every tree, and on every hillock, he may ſee plenty of honey at his own deliberate diſpoſal. I cannot then but think, with all ſubmiſſion to theſe natural philoſophers, that the whole of this is an improbable fiction; nor did I ever hear a ſingle perſon in Abyſſinia ſuggeſt, that either this or any other bird had ſuch a property. Sparman ſays it was not known to any inhabitant of the Cape, any more than that of the moroc was in Abyſſinia; it was a ſecret of nature, hid from all but theſe two great men; and I moſt willingly leave it among the catalogue of their particular diſcoveries."

MORNING, the beginning of the day, or the time of the ſun-riſing. The aſtronomers reckon morning, *mane*, from the time of midnight to that of mid-day. Thus an eclipſe is ſaid to begin at 11 o'clock in the morning, &c.

Morning ſtar, is the planet Venus, when a little [illegible] of the ſun; that is, when ſhe riſes a[illegible] In this ſituation ſhe is called by the Greeks *Phoſphorus*; by the Latins *Lucifer*, &c.

MOROCCO, an empire of Africa, comprehending a conſiderable part of the ancient Mauritania, is bounded on the weſt by the Atlantic Ocean; on the eaſt by the river of Mulvya, which ſeparates it from Algiers; on the north by the Mediterranean; and on the ſouth by Mount Atlas, or rather by the river Sus, which divides it from the kingdom of Tafilet. Its greateſt length is from the north eaſt to the ſouth-weſt, amounting to above 590 miles; its breadth is not above 260 where broadeſt, and in the moſt narrow places is not above half that breadth. Boundaries.

2 History. The ancient hiſtory of Morocco has been already given under the article Mauritania. It continued under the dominion of the Romans upwards of 400 years. On the decline of that empire it fell under the Goths, who held it till about the year 600, when the Goths were driven out by the Vandals, the Vandals by the Greeks, and they in their turn by the Saracens, who conquered not only this empire, but we may ſay the whole continent of Africa; at leaſt their religion, one way or other, is to be found in all parts of it. The Saracen empire did not continue long united under one head, and many princes ſet up for themſelves in Africa as well as elſe where, through whoſe diſſenſions the Almoravides were at length raiſed to the ſovereignty, as related under the article Algiers, n° 2. Yuſef, or Joſeph, the ſecond monarch of that line, built the city of Morocco, conquered the kingdom of Fez, and the Mooriſh dominions in Spain: all which were loſt by his grandſon Abou Hali, who was defeated and killed by the Spaniards. On this prince's death the crown paſſed to the Mohedians, or Almohedes, with whom it had not continued above three generations, when Mohammed the ſon of Al Manſur loſt the famous battle of Sierra Morena, in which 200,000 Moors were ſlain, and in conſequence of which Alphonſo X. retook a great many of the Mooriſh conqueſts immediately after.

Mohammed died ſoon after this diſgrace, and left ſeveral ſons, between whom a civil war enſued, during which the viceroys of Fez, Tunis, and Tremeſen, found means to eſtabliſh themſelves as independent princes. At length one of the princes of the royal blood of Tremeſen having defeated the Almohedes, made himſelf maſter of the kingdoms of Morocco and Fez, and entailed them on his own family. In a ſhort time, however, this family was expelled by the Merini; the Merini by the Oatazes, and theſe by the Sharifs of Haſeen, who have kept the government ever ſince.

This happened about the year 1516; and ſince that time, what we have under the name of hiſtory is little elſe than a catalogue of the enormous vices and exceſſes of the emperors. They have been in general a ſet of bloody tyrants; though they have had among them ſome able princes, particularly Muley Moluc who defeated and killed Don Sebaſtian king of Portugal. See the article Portugal, n° 26. They have lived in almoſt a continual ſtate of warfare with the kings of Spain and other Chriſtian princes ever ſince; nor does the crown of Great Britain ſometimes diſdain, as in the year 1769, to purchaſe their friendſhip with preſents.

Nothing can be conceived more unjuſt and deſpotic than the government of Morocco, and nothing more degenerated than the character of the people. The emperor is allowed to have not only an uncontrollable power over the lives and fortunes of his ſubjects, but in a great meaſure over their conſciences, ſuch as they are; inaſmuch as he is the only perſon who, as the ſucceſſor of the prophet, has a right to interpret the Koran; and appoints all the judges under him, of whom thoſe of Morocco and Fez are the chief, whoſe buſineſs it is to explain and diſpenſe all matters relating to their religion; and who, being his creatures and dependents dare not ſteer otherwiſe than as he directs. Whenever therefore the laws are enacted by him, and proclaimed by his governors in all the provinces, as is commonly done, that none may plead ignorance, they are everywhere received with an implicit and religious ſubmiſſion. On the other hand, the ſubjects are bred up with a notion, that thoſe who die in the execution of his command are entitled to an immediate admittance into paradiſe, and thoſe who have the honour to die by his hand to a ſtill greater degree of happineſs in it. After this we need not wonder at finding ſo much cruelty, oppreſſion, and tyranny on the one ſide, and ſo much ſubmiſſion, paſſiveneſs, and miſery on the other. 3 Government.

This latter, however, extends no farther than the Moors; for as to the mountaineers, the ſubjection and tribute they pay to thoſe tyrants was always involuntary, and altogether forced; and as for the negroes, their zeal and attachment is owing merely to the great ſway and power which they have gained in the government, on various accounts. They were firſt introduced, or rather their importation increaſed, by the policy of Muley Iſhmael, a late emperor, at a period when there was a great decreaſe of population in the empire, occaſioned in ſome degree by the enormous cruelties exerciſed by its former ſovereigns, who have been known not unfrequently, through a ſlight diſguſt, to abandon a whole town or province to the ſword. In the character of Muley Iſhmael, were found the moſt ſingular inconſiſtencies; for it is certain, that although a tyrant of the ſame claſs, yet in other reſpects, as if to repair the miſchief which he committed, he left nothing undone for the encouragement of population.—He introduced, as above-mentioned, large colonies of negroes from Guinea; built towns for them, many of which are ſtill remaining: aſſigned them portions of land, and encouraged their increaſe by every poſſible means. He ſoon initiated them in the Mahometan faith; and had his plan been followed, the country by this time would have been populous, and probably flouriſhing. As the negroes are of a more lively, active, and enterpriſing diſpoſition than the Moors, they might ſoon have been taught the arts of agriculture and their ſingular ingenuity might have been directed to other uſeful purpoſes. It is true, Muley Iſhmael, when he adopted this plan, had more objects in view than that of merely peopling his dominions. He ſaw plainly that his own ſubjects were of too capricious a diſpoſition to form ſoldiers calculated for his tyrannical purpoſes. They had uniformly manifeſted an inclination to change their ſovereigns, though more from the love of variety than to reform the government, or reſtrain the abuſes of tyranny. In ſhort, whatever 4 Account of the black troops.

revolution

revolutions took place in the country, conſiſted merely in a change of one tyrant for another. Muley Iſhmael had diſcernment enough to ſee, therefore, that by forming an army of ſlaves, whoſe ſole dependence ſhould reſt upon their maſter, he could eaſily train them in ſuch a manner as to act in the ſtricteſt conformity to his wiſhes. He ſoon learnt that the great object with the negroes was plenty of money and liberty of plunder; in theſe he liberally indulged them, and the plan fully anſwered his expectations. Though, however, Muley Iſhmael had no great merit in introducing ſubjects for the purpoſes of tyranny, yet the good effects of this new colonization were very generally experienced. By intermarrying among themſelves, and intermixing among the Moors (for the Moors will keep negro women as concubines, though they ſeldom marry them), a new race of people ſtarted up, who became as uſeful ſubjects as the native inhabitants, and brought the empire into a much more flouriſhing ſtate than it had ever been in ſince their great revolution.

Sidi Mahomet, his grandſon and ſucceſſor, had different views, and was actuated by different motives. From his inordinate avarice, he ceaſed to act towards his black troops in the generous manner which had diſtinguiſhed his predeceſſor Muley Iſhmael; and they ſoon ſhowed themſelves diſcontented with his conduct. They frequently threatened to revolt, and ſupport thoſe of his ſons who were in oppoſition, and who promiſed them the moſt liberal rewards. They offered to place his eldeſt ſon Muley Ali, who is ſince dead, on the throne; but this prince, not unmindful of the duty which he owed his father and ſovereign, declined their offer. They next applied to Muley Yazid, the late emperor, who at firſt accepted of the aſſiſtance they tendered, but in a ſhort time relinquiſhed the plan. Sidi Mahomet, diſguſted with this conduct of the negroes, determined to curb their growing power, by diſbanding a conſiderable part of theſe troops, and baniſhing them to diſtant parts of the empire. This important mode of population has therefore been of late years neglected, while no better ſyſtem has been ſubſtituted in its room; for though the late emperor indulged in cruelty much leſs frequently than his predeceſſors, yet population has, perhaps, been more completely impeded by the general poverty which he has introduced into the country by his ſevere exactions, than if he had made a liberal uſe of the ſword or of the bow-ſtring.

5 Deſpotiſm of the emperors.

A moſt flagrant ſpecies of deſpotiſm, which renders the emperors ſtill more formidable to their ſubjects, is their making themſelves their ſole heirs, and, in virtue of that, ſeizing upon all their effects, and making only ſuch proviſion for their families as they think proper; and often, on ſome frivolous pretence, leaving them deſtitute of any, according to the liking or diſlike they bear to the deceaſed; ſo that, upon the whole, they are the only makers, judges, and interpreters and in many inſtances likewiſe the executioners, of their own laws, which have no other limits than their own arbitrary will. To preſerve, however, ſome ſhow or ſhadow of juſtice, they allow their mufti a kind of ſuperiority in ſpirituals, and a ſort of liberty to the meaneſt ſubject to ſummon them before his tribunal. But the danger which ſuch an attempt would bring upon a plaintiff, perhaps no leſs than death and deſtruction, is of itſelf ſufficient to deter any man from it; eſpecially conſidering the little probability there is that the judges of it would run the riſk of declaring themſelves againſt a monarch whoſe creatures they are, and on whom their lives and fortunes ſo abſolutely depend. The titles which the emperors of Morocco aſſume, are thoſe of *Moſt glorious, mighty, and noble emperor of Afric, king of Fez and Morocco, Taphilet, Suz, Darha, and all the Algarbe, and its territories in Afric; grand Scharif* (or, as others write it, *Xarif*, that is, "ſucceſſor, or vicegerent,") *of the great prophet Mohammed, &c.*

6 Adminiſtration of juſtice.

The judges or magiſtrates that act immediately under the emperor are either ſpiritual or temporal, or rather eccleſiaſtical and military. The mufti and the kadis are judges of all religious and civil affairs; and the baſhaws, governors, alcaides, and other military officers, of thoſe that concern the ſtate or the army: all of them the moſt obſequious creatures and ſlaves of their prince, and no leſs the rapacious tyrants of his ſubjects, and from whom neither juſtice nor favour can be obtained but by mere dint of money and extortionate bribery, from the higheſt to the loweſt. Neither can it indeed be otherwiſe in ſuch an arbitrary government, where the higheſt poſts muſt not only be bought of the prince at a moſt extravagant price, and kept only by as exorbitant a tribute, which is yearly paid to him, but where no one is ſure to continue longer than he can bribe ſome of the courtiers to inſinuate to the monarch that he pays to the utmoſt of his power, and much beyond what was expected from him. Add to this, that theſe baſhaws, governors, &c. are obliged to keep their agents and ſpies in conſtant pay at court, to prevent their being ſupplanted by higher bidders, ſlanderers, or other underminers. In ſhort, power and weakneſs, rank and meanneſs, opulence and indigence, are here equally dependent, equally uncertain. There are inſtances of the ſultan elevating at once a common ſoldier to the rank of a baſhaw, or making him a confidential friend; the following day he would perhaps impriſon him, or reduce him again to the ſtation of a private ſoldier. It is ſurpriſing that men under theſe circumſtances ſhould be ambitious of rank, or deſirous of riches and power. Yet ſuch is the diſpoſition of theſe people, that they have an unbounded thirſt for rank and power with all their uncertainties; and what is more extraordinary, when they have obtained a high ſtation, they ſeldom fail to afford their ſovereign a plea for ill treating them, by abuſing in ſome way or other their truſt.

7 Royal revenues.

From what has been ſaid, it may be reaſonably concluded that the revenue ariſing to the emperor from the laſt mentioned ſource, that of bribery, extortion, and confiſcation, muſt be very conſiderable, though there is no poſſibility to make any other conjecture of its real amount than that it muſt be an immenſe one. Another conſiderable branch is the piratical trade, which brings the greater income into his treaſury, as he is not at any expence either for fitting of corſair veſſels out, or maintaining their men; and yet has the tenth of all the cargo and of all the captives; beſides which, he appropriates to himſelf all the reſt of them, by paying the captors 50 crowns *per* head, by which means he engroſſes all the ſlaves to his own ſervice and advantage. This article is indeed a very conſiderable addition to his revenue, not only as he ſells their ranſom at a very high rate, but likewiſe as he has the profit of all their labour, without allowing them any other maintenance than a little bread and oil, or any other aſſiſtance when ſick than what medicines a Spaniſh convent, which he tolerates there, gives them gratis; and which, nevertheleſs, is forced to pay him an annual preſent for that toleration, beſides furniſhing the court with medicines, and the ſlaves with lodging and diet when they are not able to work. Another branch of his revenue conſiſts in the tenth part of all cattle, corn, fruits, honey, wax, hides, rice, and other products of the earth, which is exacted of the Arabs and Brebes, as well as of the natives; and theſe are levied, or rather farmed, by the baſhaws, governors, alcaides, &c. with all poſſible ſeverity. The Jews and Chriſtians likewiſe pay an income or capitation, the former of ſix crowns *per* head of all males from 15 years and upwards, beſides other arbitrary impoſts, fines, &c. That on the Chriſtians, for the liberty of trading in his dominions, riſes and falls according to their number, and the commerce they drive; but which, whatever it may bring yearly into his coffers, is yet detrimental to trade in general, ſeeing it diſcourages great numbers from ſettling there, notwithſtanding the artful invitation which the emperors and their miniſters make uſe of to invite them to it; for, beſides thoſe arbitrary exactions, there is ſtill another great hardſhip attending them, viz. that they cannot leave the country without forfeiting all their debts and effects to the crown. The duties on all imports and exports is another branch of his income, the amount of which, *communibus annis*, no author has yet given us any account of; only conſul Hatfield has computed the whole yearly revenue, including ordinaries and extraordinaries, to amount to 500 quintals of ſilver, each quintal, or 100 lb. weight, valued at ſomewhat above 330 l. Sterling: ſo that the whole amounts to no more, according to him, than 165,000 l.; a ſmall revenue indeed for ſo large an empire, if the calculation may be depended upon. But St Olan, though he does not pretend ſo much as to gueſs at the yearly amount of it, in general repreſents it as ſo conſiderable, that Muley Iſhmael was reckoned to have amaſſed out of it a treaſure in gold and ſilver of about 50 effective millions; but whether of crowns or livres he does not tell us, nor how he came by his knowledge of it; becauſe that politic prince, even by his own confeſſion, not only cauſed all his riches to be buried in ſundry places under-ground, his gold and ſilver to be melted into great lumps, and laid in the ſame privacy under-ground, but likewiſe all thoſe whom he entruſted with the ſecret to be as privately murdered.

8 Climate of Morocco.

The climate of the empire of Morocco is in general ſufficiently temperate, healthy, and not ſo hot as its ſituation might lead us to ſuppoſe. The chain of mountains which form Atlas, on the eaſtern ſide, defends it from the eaſt winds, that would ſcorch up the earth were they frequent. The ſummit of theſe mountains is always covered with ſnow; and their abundant deſcending ſtreams ſpread verdure through the neighbourhood, make the winter more cold, and temper the heats of ſummer. The ſea on the weſt ſide, which extends along the coaſt from north to ſouth, alſo refreſhes the land with regular breezes, that ſeldom vary according to their ſeaſons. At a diſtance from the ſea, within land, the heat is ſo great that the rivulets become dry in ſummer; but as in hot countries dews are plentiful, the nights are there always cool. The rains are tolerably regular in winter: and are even abundant, though the atmoſphere is not loaded with clouds as in northern latitudes. Thoſe rains which fall by intervals are favourable to the earth, and increaſe its fecundity. In January the country is covered with verdure, and enamelled with flowers. Barley is cut in March, but the wheat harveſt is in June, All fruits are early in this climate; and in forward years the vintage is over in the beginning of September. Though in general there is more uniformity and leſs variation in hot than in northern climates, the firſt are nevertheleſs expoſed to the intemperance of weather; too heavy rains often impede the harveſt; and drought has ſtill greater inconveniences, for it inſures the propagation of locuſts. Theſe fatal inſects, which have ſo often laid deſolate hot countries, ſometimes commit the moſt dreadful ravages in the empire of Morocco. They come from the ſouth, ſpread themſelves over the lands, and increaſe to infinity when the rains of ſpring are not ſufficiently heavy to deſtroy the eggs they depoſit on the earth. The large locuſts, which are near three inches long, are not the moſt deſtructive: as they fly, they yield to the current of wind, which hurries them into the ſea, or into ſandy deſerts, where they periſh with hunger or fatigue. The young locuſts, that cannot fly, are the moſt ruinous; they creep over the country in ſuch multitudes, that they leave not a blade of graſs behind; and the noiſe of their feeding announces their approach at ſome diſtance. The devaſtations of locuſts increaſe the price of proviſions, and often occaſion famines: but the Moors find a kind of compenſation in making food of theſe inſects; prodigious quantities of which are brought to market ſalted and dried like red herrings. They have an oily and rancid taſte, which habit only can render agreeable: they are eat here, however, with pleaſure. The winters in Morocco are not ſevere, nor is there an abſolute need of fire. In the coldeſt weather the thermometer ſeldom ſinks to more than five degrees above the freezing point. The longeſt days in Morocco are not more than 14 hours, and the ſhorteſt conſequently not leſs than ten.

9 Soil, and

The ſoil of Morocco is exceedingly fertile. It is moſt ſo in the inland provinces. On the weſtern coaſt it is in general light and ſtony, and is better adapted to the vine and olive than the culture of wheat. They annually burn, before the September rains, the ſtubble, which is left rather long; and this and the dung of cattle, every day turned to paſture, form the ſole manure the land receives. The ſoil requires but little labour, and the ploughing is ſo light that the furrows are ſcarcely ſix inches deep; for which reaſon, in ſome provinces, wooden ploughſhares are uſed for cheapneſs.

The empire of Morocco might ſupply itſelf with all neceſſaries, as well from the abundance and nature of its products, as from the few natural or artificial wants of the Moors occaſioned by climate or education. Its wealth conſiſts in the fruitfulneſs of its ſoil: its corn, fruits, flocks, flax, ſalt, gums, and wax, would not only ſupply its neceſſities, but yield a ſuperflux, which might

become

10 Productions. become an object of immenſe trade and barter with other nations. Such numerous exports might return an inexhauſtible treaſure, were its government fixed and ſecure, and did ſubjects enjoy the fruits of their labour and their property in ſafety. The increaſe of corn in Morocco is often as ſixty to one, and thirty is held to be but an indifferent harveſt. The exportation of this corn is burdened by the laws, and by the prejudices of an intolerant religion, which permits them not to ſell their ſuperabundance to infidels. The property of land is beſides entirely precarious; ſo that each individual grows little more than ſufficient for his own wants. Hence it happens, when the harveſt fails from the ravages of locuſts or the intemperance of ſeaſons, theſe people are expoſed to miſery, ſuch as Europeans have no conception of, who enjoy a ſtable adminiſtration, which obviates and provides for all their wants.

The Moors, naturally indolent, take little care of the culture of their fruits. Oranges, lemons, and thick-ſkinned fruits, the trees of which require little nurture, grow in the open fields; and there are very large plantations of them found, which they take the trouble to water in order to increaſe their product. Their vines, which yield excellent grapes, are planted as far as the 33d degree, as in the ſouthern provinces of France, and are equally vigorous. But at Morocco, where they yield a large and delicious grape, they are ſupported by vine-poles five and ſix feet above the ground; and as they are obliged to be watered, the little wine made there is ſeldom preſerved. Figs are very good in ſome parts of the empire, but toward the ſouth they are ſcarcely ripe before they are full of worms; the heats and night dews may, perhaps, contribute to this ſpeedy decay. Melons, for the ſame reaſon, are rarely eatable; they have but a moment of maturity; which paſſes ſo rapidly that it is with difficulty ſeized. Water-melons are every where reared, and in ſome provinces are excellent. Apricots, apples, and pears, are in tolerable plenty in the neighbourhood of Fez and Mequinez, where water is leſs ſcarce and the climate more temperate. But in the plain, which extends along the weſtern coaſt, theſe delicate fruits are very indifferent, have leſs juice or taſte, and the peaches there do not ripen, The tree called the prickly pear, or the Barbary fig, is plentifully found in the empire of Morocco; and is planted round vineyards and gardens, becauſe its thick and thorny leaves, which are wonderfully prolific, form impenetrable hedges. From theſe leaves a fruit is produced, covered with a thorny ſkin, that muſt be taken off with care. This fruit is mild, and full of very hard, ſmall, kernels. The olive is every where found along the coaſt, but particularly to the ſouth. The trees are planted in rows, which form alleys the more agreeable becauſe the trees are large, round, and high in proportion. They take care to water them, the better to preſerve the fruit. Oil of olives might here be plentifully extracted, were taxation fixed and moderate; but ſuch has been the variation it has undergone, that the culture of olives is ſo neglected as ſcarcely to produce oil ſufficient for internal conſumption. In 1768 and 1769 there were near 40,000 quintals of oil exported from Modogore and Santa Cruz to Marſeilles, and ten years after it coſt 15 d. per pound. Thus do the vices of government expoſe nations to dearth and famine who live in the very boſom of abundance.

From the province of Duquella to the ſouth of the empire, there are foreſts of the arga tree, which is thorny, irregular in its form, and produces a ſpecies of almond exceedingly hard, with a ſkin as corroſive as that of walnuts. Its fruit conſiſts of two almonds, rough and bitter, from which an oil is produced very excellent for frying. In order to uſe this oil, it muſt be purified by fire, and ſet in a flame which muſt be ſuffered to die away of itſelf; the moſt greaſy and corroſive particles are conſumed, and its acrid qualities are thus wholly deſtroyed. When the Moors gather theſe fruits, they bring their goats under the trees; and as the fruit falls the animals carefully nibble off the ſkins. In the ſame province alſo is found the tree which produces gum ſandarac; alſo that which yields the tranſparent gum; but the latter is moſt productive, and affords the beſt gum the farther we proceed ſouthward, where the heat and night-dews may perhaps render the vegetable ſecretion more pure and copious.

In the province of Suz, between the 25th and 30th degrees, the inhabitants have an almond harveſt, which varies, little becauſe of the mildneſs of the climate; but the fruit is ſmall for which reaſon they take little care of the trees, and they degenerate with time. The palm tree is common on the ſouthern provinces of Morocco; but dates ripen there with difficulty, and few are good except in the province of Suz and towards Tafilet. On the coaſt of Salle and Mamora there are foreſts of oak, which produce acorns near two inches long. They taſte like cheſnuts, and are eat raw and roaſted. This fruit is called *Bellote*, and is ſent to Cadiz where the Spaniſh ladies hold it in great eſtimation. The empire of Morocco alſo produces much wax: but ſince it has been ſubjected by the emperor to the payment of additional duties, the country people have very much neglected the care of their hives. Salt abounds in the empire, and in ſome places on the coaſt requires only the trouble of gathering. Independent of the ſalt-pits formed by the evaporation of the ſoft water, there are pits and lakes in the country whence great quantities are obtained. It is carried even as far as Tombut, whence it paſſes to the interior parts of Africa.

The Moors cultivate their lands only in proportion to their wants; hence two-thirds of the empire at leaſt lie waſte. Here the *doum*, that is, the fan or wild palm tree, grows in abundance; and from which thoſe people, when neceſſity renders them induſtrious, find great advantage. The ſhepherds, mule-drivers, camel-drivers, and travellers, gather the leaves, of which they make mats, fringes, baſkets, hats, *ſhoaris* or large wallets to carry corn. twine, ropes, girths, and covers for the pack-ſaddles. This plant, with which alſo they heat their ovens. produces a mild and reſinous fruit that ripens in September and October. It is in form like the raiſin, contains a kernel, and is aſtringent and very proper to temper and counteract the effects of the watery and laxative fruits, of which theſe people in ſummer make an immoderate uſe.

Unacquainted with the ſources of wealth of which their anceſtors were poſſeſſed, the Moors pretend there are gold and ſilver mines in the empire, which the emperors 11 Mines.

perors will not permit to be worked, leſt their ſubjects ſhould thus find means to ſhake off their yoke. It is not improbable but that the mountains of Atlas may contain unexplored riches; but there is no good proof that they have ever yielded gold and ſilver. There are known iron mines in the ſouth; but the working of them has been found ſo expenſive, that the natives would rather uſe imported iron, notwithſtanding the heavy duty it pays, by which its price is doubled. There are copper mines in the neighbourhood of Santa Cruz, which are not only ſufficient for the ſmall conſumption of the empire, where copper is little uſed, but are alſo an object of exportation, and would become much more ſo were the duties leſs immoderate.

12 Animals. Neither the elephant nor the rhinocerous is to be found either in this or the other ſtates of Barbary; but their deſarts abound with lions, tigers, leopards, hyænas, and monſtrous ſerpents. The Barbary horſes were formerly very valuable, and thought equal to the Arabian. Though their breed is now ſaid to be decayed, yet ſome very fine ones are occaſionally imported into England. Camels and dromedaries, aſſes, mules, and kumrahs (a moſt ſerviceable creature, begot by an aſs upon a cow), are their beaſts of burden. Their cows are but ſmall, and barren of milk. Their ſheep yield but indifferent fleeces, but are very large, as are their goats. Bears, porcupines, foxes, apes, hares, rabbits, ferrets, weaſels, moles, cameleons, and all kinds of reptiles, are found here. Patridges and quails, eagles, hawks, and all kinds of wild-fowl, are frequent on the coaſt.

13 Mountains, &c. As to mountains, the chief are that chain which goes under the name of *Mount Atlas*, and runs the whole length of Barbary from eaſt to weſt, paſſing through Morocco, and abutting upon that ocean which ſeparates the eaſtern from the weſtern continent, and is from this mountain called the *Atlantic Ocean*. See Atlas. The principal rivers, beſides the Malva or Mulvia abovementioned, which riſes in the deſarts, and running from ſouth to north divides Morocco from the kingdom of Algiers, are the Suz, Ommirabih, Rabbata, Larache, Darodt, Sebon, Gueron, and Tenſift, which riſe in Mount Atlas, and fall into the Atlantic Ocean. The chief capes are Cape Threeforks on the Mediterranean, Cape Spartel at the entrance of the ſtraits, Cape Cantin, Cape None, and Cape Rajador, on the Atlantic Ocean. Of the bays the moſt conſiderable are, the bay of Tetuan in the Mediterranean, and the bay of Tangier in the ſtraits of Gibraltar.

14 Inland trade. The traffic of the empire by land is either with Arabia or Negroland: to Mecca they ſend caravans, conſiſting of ſeveral thouſand camels, horſes, and mules, twice every year, partly for traffic, and partly on a religious account; for numbers of pilgrims take that opportunity of paying their devotions to their great prophet. The goods they carry to the eaſt are woollen manufactures, leather, indigo, cochineal, and oſtrich feathers; and they bring back from thence, ſilk, muſlins, and drugs. By their caravans to Negroland, they ſend ſalt, ſilk, and woollen manufactures, and bring back gold and ivory in return, but chiefly negroes.

15 Trade. The caravans always go ſtrong enough to defend themſelves againſt the wild Arabs in the deſarts of Africa and Aſia; though, notwithſtanding all their vigilance, ſome of the ſtragglers and baggage often fall into their hands: they are alſo forced to load one half of their camels with water, to prevent their periſhing with drought and thirſt in thoſe inhoſpitable deſarts. And there is ſtill a more dangerous enemy, and that is the ſand itſelf: when the winds riſe, the caravan is perfectly blinded with duſt; and there have been inſtances, both in Africa and Aſia, where whole caravans, and even armies, have been buried alive in the ſands. There is no doubt alſo, but both men and cattle are ſometimes ſurpriſed by wild beaſts, as well as robbers, in thoſe vaſt deſarts; the hot winds alſo, blowing over a long tract of burning ſand, are equal almoſt to the heat of an oven, and deſtroy abundance of merchants and pilgrims. If it was not for devotion, and in expectation of very great gains, no man would undertake a journey in theſe deſarts; great are the hazards and fatigues they muſt of neceſſity undergo; but thoſe that go to Mecca aſſure themſelves of paradiſe if they die, and have uncommon honours paid them at home if they ſurvive. People crowd to be taken into the eaſtern caravans; and the gold that is found in the ſouth make them no leſs eager to undertake that journey.

16 Foreign commerce. The natives have hardly any trading veſſels, but are ſeldom without ſome corſairs. Theſe, and European merchant-ſhips, bring them whatever they want from abroad; as linen and woollen cloth, ſtuffs, iron wrought and unwrought, arms, gunpowder, lead, and the like: for which they take in return, copper, wax, hides, Morocco leather, wool (which is very fine), gums, ſoap, dates, almonds, and other fruits. The duties paid by the Engliſh in the ports of Morocco are but half thoſe paid by other Europeans. It is a general obſervation, that no nation is fond of trading with theſe ſtates, not only on account of their capricious deſpotiſm, but the villainy of their individuals, both natives and Jews, many of whom take all opportunities of cheating, and when detected are ſeldom puniſhed.

The land-forces of the emperor of Morocco conſiſt principally of the black troops already mentioned, and ſome few white; amounting altogether to an army of about 36,000 men upon the eſtabliſhment, two thirds of which are cavalry. This eſtabliſhment, however, upon occaſion admits of a conſiderable increaſe, as every man is ſuppoſed to be a ſoldier, and when called upon is obliged to act in that capacity. About 6000 of the ſtanding forces form the emperor's body guard, and are always kept near his perſon; the remainder are quartered in the different towns of the empire, and are under the charge of the baſhaws of the provinces. They are all clothed by the emperor, and receive a trifling pay; but their chief dependence is on plunder, which they have frequent opportunities of acquiring. The ſoldiers have no diſtinction in dreſs from the other Moors; and are only marked by their accoutrements, which conſiſt of a ſabre, a very long muſket, a ſmall red leathern box to hold their balls, which is fixed in front by means of a belt, and a powder-horn ſlung over their ſhoulders. The army is under the direction of a commander in chief, four principal baſhaws, and alcaides who command diſtinct diviſions. 17 Land-forces.

The black troops are naturally of a very fiery diſpoſition, capable of enduring great fatigue, hunger, thirſt, and every difficulty to which a military life is expoſed. They appear well calculated for ſkirmiſhing parties, or for the purpoſe of harraſſing an enemy; but were they obliged to undergo a regular attack, from their total want of diſcipline they would ſoon be routed. In all their manœuvres they have no notion whatever of order and regularity, but have altogether more the appearance of a rabble than of an army. Though theſe troops are ſuppoſed to be the ſtrongeſt ſupport of deſpotiſm, yet from their avarice and love of variety they frequently prove the moſt dangerous enemies to their monarchs; they are often known to excite ſedition and rebellion, and their inſolence has ſometimes proceeded to ſuch exceſſes as nearly to overturn the government. Their conduct is governed only by the paſſions. Thoſe who pay them beſt, and treat them with the greateſt attention, they will always be moſt ready to ſupport. This circumſtance, independent of every other, makes it the intereſt of the monarch to keep his ſubjects in as complete a ſtate of poverty as poſſible. The Moors are indeed remarkable for inſincerity in their attachments, and for their love of variety; a military force, in this kingdom eſpecially, is therefore the only means which a deſpotic monarch can employ for ſecuring himſelf in the poſſeſſion of the throne. Ignorant of every principal of rational liberty, whatever conteſts this devoted people may engage in with their tyrants, are merely conteſts for the ſucceſſion; and the ſole object for which they ſpend their lives and their property, is to exchange one mercileſs deſpot for another.

18 Navy.

The emperor's navy conſiſts of about 15 ſmall frigates, a few zebecks, and between 20 and 30 row-galleys. The whole is commanded by one admiral; but as theſe veſſels are principally uſed for the purpoſes of piracy, they ſeldom unite in a fleet. The number of the ſeamen in ſervice are computed at 6000.

19 Coins.

The coins of this empire are a fluce, a banquil, and ducat. The fluce is a ſmall copper coin, twenty whereof make a blanquil, of the value of two pence Sterling. The blanquil is of ſilver, and the ducat of gold, not unlike that of Hungary, and worth about nine ſhillings. Both theſe pieces are ſo liable to be clipped and filed by the Jews, that the Moors always carry ſcales in their pockets to weigh them; and when they are found to be much diminiſhed in their weight, they are recoined by the Jews, who are maſters of the mint, by which they gain a conſiderable profit; as they do alſo by exchanging the light pieces for thoſe that are full weight. Merchants accounts are kept in ounces, ten of which make a ducat; but in payments to the government, it is ſaid they will reckon ſeventeen and one-half for a ducat.

20 Religion and

With reſpect to religion, the inhabitants of Morocco are Mohammedans, of the ſect of Ali; and have a mufti or high-prieſt, who is alſo the ſupreme civil magiſtrate, and the laſt reſort in all cauſes eccleſiaſtical and civil. They have a great veneration for their hermits, and for idiots and madmen; as well as for thoſe who by their tricks have got the reputation of wizzards: all of whom they look upon as inſpired perſons, and not only honour as ſaints while they live, but build tombs and chapels over them when dead; which places are not only religiouſly viſited by their devotees far and near, but are eſteemed inviolable ſanctuaries for all ſorts of criminals except in caſes of treaſon.

Notwithſtanding the natives are zealous Mohammedans, they allow foreigners the free and open profeſſion of their religion, and their very ſlaves have their prieſts and chapels in the capital city; though it muſt be owned that the Chriſtian ſlaves are here treated with the utmoſt cruelty.

21 Laws.

Here, as in all other Mohammedan countries, the alcoran and their comments upon it are their only written laws; and though in ſome inſtances their cadis and other civil magiſtrates are controlled by the arbitrary determinations of their princes, baſhaws, generals, and military officers, yet the latter have generally a very great deference and regard for their laws. Murder, theft, and adultery, are commonly puniſhed with death: and their puniſhments for other crimes, particularly thoſe againſt the ſtate, are very cruel; as impaling, dragging the priſoner through the ſtreets at a mule's heels till all his fleſh is torn off; throwing him from a high tower upon iron hooks; hanging him upon hooks till he die; crucifying him againſt a wall; and, indeed, the puniſhment and condemnation of criminals is in a manner arbitrary. The emperor, or his baſhaws, frequently turn executioners; ſhoot the offender, or cut him to pieces with their own hands, or command others to do it in their preſence.

22 Inhabitants of the empire of Morocco.

The inhabitants of the empire of Morocco, known by the name of *Moors*, are a mixture of Arabian and African nations formed into tribes; with the origin of whom we are but imperfectly acquainted. Theſe tribes, each ſtrangers to the other, and ever divided by traditional hatred or prejudice, ſeldom mingle. It ſeems probable that moſt of the caſts who occupy the provinces of Morocco have been repulſed from the eaſtern to the weſtern Africa, during thoſe different revolutions by which this part of the world has been agitated; that they have followed the ſtandard of their chiefs, whoſe names they have preſerved; and that by theſe they, as well as the countries they inhabit, are diſtinguiſhed. At preſent theſe tribes are called *caſiles* or *cabiles*, from the Arabic word *kobeila*; and they are ſo numerous, that it is impoſſible to have a knowledge of them all. In the northern provinces are enumerated Beni-Garir, Beni-Guernid, Beni-Manſor, Beni-Oriegan, Beni-Chelid, Beni-Juſeph, Beni-Zarnol, Beni-Razin, Beni-Gebara, Beni-Buſeibet, Beni-Gualid, Beni-Yeder, Beni-Gueiaghel, Beni-Guaſeval, Beni-Guamud, &c. Towards the eaſt are, Beni-Sayd, Beni-Teuſin, Beni-Ieſſetin, Beni-Buhalel, Beni-Telid, Beni-Soffian, Beni-Becil, Beni-Zequer, &c.—and to the ſouth, thoſe of Beni-Fonſecara, Beni-Aros, Beni-Haſſen, Beni-Mager, Beni-Baſil, Beni-Seba, with an infinite number of others (A). The people

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(A) The word *Ben*, that is to ſay "Son," is uſually employed to ſignify "family deſcendants;" thus, *Beni-Haſſen*, and *Beni-Juſeph*, ſignify, "the children or deſcendents of Haſſen and of Joſeph." The Moors, as a more extenſive generic term, call men *Ben-Adam*; that is, "the deſcendants or ſons of Adam."

people who depend on Algiers, Tunis, and Tripoli, are in like manner divided into an infinite number of theſe tribes, who are all ſo ancient that they themſelves have not the leaſt idea of their origin.

The native ſubjects of the empire of Morocco may be divided into two principal claſſes; the *Brebes* and the *Moors*.

23
The Brebes, or Mountaineers.

The etymology of the name, and the origin of the people, of the firſt claſs, are equally unknown. Like the Moors, at the time of the invaſion by the Arabs, they may have adopted the Mahometan religion, which is conſonant to their manners and principal uſages; but they are an ignorant people, and obſerve none of the precepts of that religion, but the averſion it enjoins againſt other modes of worſhip — Mahometaniſm has not obliterated the cuſtoms and ancient prejudices of theſe people, for they eat the wild boar; and in places where there are vineyards, they drink wine, *provided* (ſay they) *that it is of our own making*. In order to preſerve it in the ſouthern parts of Mount Atlas, they put it in earthen veſſels, and in barrels made of the hollowed trunk of a tree, the upper end of which is done over with pitch; and theſe are depoſited in cellars, or even in water. In the northern province of Rif they boil it a little, which renders it leſs apt to inebriate, and perhaps they think that in this ſtate they may reconcile the uſe of it with the ſpirit of their law.

Confined to the mountains, the Brebes preſerve great animoſity againſt the Moors, whom they confound with the Arabs, and conſider as uſurpers.— They thus contract in their retreats a ferocity of mind, and a ſtrength of body, which makes them more fit for war and every kind of labour than the Moors of the plain in general are. The independence they boaſt of gives even a greater degree of expreſſion to their countenance. The prejudices of their religion make them ſubmit to the authority of the emperors of Morocco; but they throw off the yoke at their pleaſure, and retire into the mountains, where it is difficult to attack or overcome them. The Brebes have a language of their own, and never marry but among each other. They have tribes or cafiles among them who are exceedingly powerful both by their number and courage. Such are thoſe of Gomera on the borders of Rif, of Gayroan toward Fez, of Timoor extending along mount Atlas from Mequinez to Tedla, of Shavoya from Tedla to Duquella, and of Miſhboya, from Morocco to the ſouth. The emperor of Morocco keeps the children of the chiefs of theſe tribes at court as hoſtages for their fidelity. The Brebes have no diſtinction of dreſs; they are always clothed in woollen like the Moors; and, though they inhabit the mountains, they rarely wear any thing on their heads. Theſe mountaineers, as well as their wives, have exceedingly fine teeth; and poſſeſs a degree of vigour and intrepidity which diſtinguiſhes them from the inhabitants of the plains. It is common for them to hunt lions and tigers; and the mothers have a cuſtom of decorating their children with a tiger's claw or the remnant of a lion's hide on the head, thinking that by this means they will acquire ſtrength and courage; and from a ſimilar ſuperſtition, young wives are in uſe to give their huſbands the ſame as a ſort of amulets.

The Brebes and the Shellu having a language common to themſelves, and unknown to the Moors, both muſt have had the ſame origin, notwithſtanding the difference there is in their mode of life. The *Shellu* live on the frontiers of the empire toward the ſouth; their population is by no means ſo great as that of the Brebes, nor are they ſo ferocious; they do not marry with other tribes; and though they practice many ſuperſtitious rites, they are faithful obſervers of their religion.

The *Moors* of the plains may be diſtinguiſhed into thoſe who lead a paſtoral life, and thoſe who inhabit the cities.

24
The Moors of the country.

The former live in tents; and that they may allow their ground a year's reſt, they annually change the place of their encampments, and go in ſearch of freſh paſturage; but they cannot take this ſtep without acquainting their governor. Like the ancient Arabs, they are entirely devoted to a paſtoral life: their encampments, which they call *douhars*, are compoſed of ſeveral tents, and form a creſcent; or they are ranged in two parallel lines, and their flocks, when they return from paſture, occupy the centre. The entrance of the douhar is ſometimes ſhut with faggots of thorns; and the only guard is a number of dogs, that bark inceſſantly at the approach of a ſtranger. Each douhar has a chief, ſubordinate to an officer of the higheſt rank, who has under his adminiſtration a number of camps; and ſeveral of theſe ſubordinate diviſions are united under the government of a pacha, who has often 1000 douhars in his department.

The tents of the Moors, viewed in front, are of a conical figure; they are from 8 to 10 feet high, and from 20 to 25 feet long; like thoſe of high antiquity, they reſemble a boat reverſed. They are made of cloth compoſed of goats' and camels' hair, and the leaves of the wild palm, by which they are rendered impervious to water; but at a diſtance their black colour gives them a very diſagreeable look.

25
Their ſimple way of life.

The Moors, when encamped, live in the greateſt ſimplicity, and exhibit a faithful picture of the inhabitants of the earth in the firſt ages of the world. The nature of their education, the temperature of the climate, and the rigour of the government, diminiſh the wants of the people, who find in their plains, in the milk and wool of their flocks, every thing neceſſary for food and cloathing. Polygamy is allowed among them; a luxury ſo far from being injurious to a people who have few wants, that is a great convenience in the economy of thoſe ſocieties, becauſe the women are intruſted with the whole care of the domeſtic management.

26
Occupations of the women, &c.

In their half-cloſed tents, they are employed in milking the cows for daily uſe; and when the milk abounds, in making butter, in picking their corn, their barley, and pulſe, and grinding their meal, which they do daily in a mill compoſed of two ſtones about 18 inches in diameter, the uppermoſt having a handle, and turning on an axis fixed in the under one; they make bread likewiſe every day, which they bake between two earthen plates, and often upon the ground after it has been heated by fire. Their ordinary food is the cooſcooſoo; which is a paſte made with their meal in the form of ſmall grains like Italian paſte. This cooſcooſoo is dreſt in the vapour of boiling ſoup, in a hollow diſh perforated with many ſmall holes in the bottom, and the diſh is incloſed in a kettle where meat is boiled; the cooſcooſoo, which is in the hollow diſh, grows gradually ſoft by the vapour of the broth, with which it is from time to time moiſtened. This ſimple food is very nouriſhing, and even agreeable when one has got the better of the prejudices which every nation entertains for its own cuſtoms. The common people eat it with milk or butter indifferently; but thoſe of higher rank, ſuch as the governors of provinces and lieutenants, who live in the centre of the encampments, add to it ſome ſucculent broth, made with a mixture of mutton, poultry, pigeons, or hedgehogs, and then pour on it a ſufficient quantity of freſh butter. Theſe officers receive ſtrangers in their tents with the ſame cordiality that Jacob and Laban ſhowed to their gueſts. Upon their arrival a ſheep is killed and immediately dreſſed; if they are not provided with a ſpit, they inſtantly make one of wood; and this mutton roaſted at a briſk fire, and ſerved up in a wooden diſh, has a very delicate colour and taſte.

The women in their tents likewiſe prepare the wool, ſpin it, and weave it into cloth on looms ſuſpended the whole length of the tent. Each piece is about five ells long and one and an half broad; it is neither dreſſed nor dyed, and it has no ſeam; they waſh it when it is dirty; and as it is the only habit of the Moors, they wear it night and day. It is called *Haick*, and is the true model of the ancient draperies.

27 Dreſs, &c. The Moors of the plain wear nothing but their woollen ſtuff; they have neither ſhirts nor drawers. Linen among theſe people is a luxury known only to thoſe of the court or the city. The whole wardrobe of a country Moor in eaſy circumſtances conſiſts in a haick for winter, another for ſummer, a red cap, a hood, and a pair of ſlippers. The common people both in the country and in towns wear a kind of tunick of woollen cloth, white, grey, or ſtriped, which reaches to the middle of the leg, with great ſleeves and a hood; it reſembles the habit of the Carthuſians.

The womens dreſs in the country is likewiſe confined to a haick, which covers the neck and the ſhoulders, and is faſtened with a ſilver claſp. The ornaments they are fondeſt of are ear-rings, which are either in the form of rings or creſcents, made of ſilver, bracelets, and rings for the ſmall of the leg; they wear theſe trinkets at their moſt ordinary occupations; leſs out of vanity than becauſe they are unacquainted with the uſe of caſkets or cabinets for keeping them. They alſo wear necklaces made of coloured glaſs-beads or cloves ſtrung on a cord of ſilk.

Beſides theſe ornaments, the women, to add to their beauty, imprint on their face, their neck, their breaſt, and on almoſt every part of their body, repreſentations of flowers and other figures. The impreſſions are made with a piece of wood ſtuck full of needles; with the points of which they gently puncture the ſkin, and then lay it over with a blue-coloured ſubſtance or gunpowder pulveriſed, and the marks never wear out. This cuſtom, which is very ancient, and which has been practiſed by a variety of nations, in Turkey, over all Aſia, in the ſouthern parts of Europe, and perhaps over the whole globe, is, however, not general among the Mooriſh tribes.

The Moors conſider their wives leſs in the light of companions than in that of ſlaves deſtined to labour. Except in the buſineſs of tillage, they are employed in every ſervile operation; nay, to the ſhame of humanity, it muſt be owned, that in ſome of the poorer quarters a woman is often ſeen yoked in a plough along with a mule, an aſs, or ſome other animal. When the Moors remove their douhars, all the men ſeat themſelves in a circle on the ground; and with their elbows reſting on their knees, paſs the time in converſation, while the women ſtrike the tents, fold them up into bundles, and place them on the backs of their camels or oxen. The old women are then each loaded with a parcel, and the young carry the children on their ſhoulders ſuſpended in a cloth girt round their bodies. In the more ſouthern parts, the women are likewiſe employed in the care of the horſes, in ſaddling and bridling them; the huſband, who in theſe climates is always a deſpot, iſſues his orders, and ſeems only made to be obeyed.

The women travel without being veiled; they are accordingly ſun-burnt, and have no pretenſions to beauty. There are, however, ſome quarters where they put on a little rouge: they every where ſtain their hair, their feet, and the ends of their fingers, with an herb called *henna*, which gives them a deep ſaffron colour; a cuſtom that muſt be very ancient among the people of Aſia. Abu Becre dyed his eye-brows and beard with the ſame colour, and many of his ſucceſſors imitated him. The cuſtom may have originally been a religious ceremony, which the women have turned into an ornament; but it is more probable that the cuſtom of painting the beard and hair, and that of ſhaving the head and uſing depilatories in other parts of the body, has been at firſt employed from motives of cleanlineſs in warm countries.

28 Marriages, &c. The marriage ceremonies of the Moors that live in tents pretty much reſemble thoſe of the ſame people that live in the cities. In the douhars they are generally moſt brilliant and gay; the ſtrangers that paſs along are invited, and made to contribute to the feaſt; but this is done more from politeneſs than from any mercenary motive.

The tribes of the plain generally avoid mixing by marriage with one another: the prejudices that divide theſe people are commonly perpetuated; or, if they are partially healed, they never fail to revive upon trifling occaſions, ſuch as a ſtrayed camel, or the preference of a paſture or a well. Marriages have ſometimes taken place among them, that, ſo far from cementing their differences, have occaſioned the moſt tragical ſcenes. Huſbands have been known to murder their wives, and women their huſbands, to revenge national quarrels.

Parents are not incumbered with their children, however numerous they may be, for they are very early employed in domeſtic affairs; they tend the flocks, they gather wood, and they aſſiſt in ploughing and reaping. In the evening, when they return from the field, all the children of the douhar aſſemble in a common tent, where the Iman, who himſelf can hardly ſpell, makes them read a few ſentences from the Koran written on boards, and inſtructs them in their religion by the light of a fire made of ſtraw, of buſhes, and cow-dung dried in the ſun. As the heat is very great in the midland parts of the country, children of both ſexes go quite naked till the age of nine or ten.

29 Entertainment of travellers. The douhars diſperſed over the plains are always in the neighbourhood of ſome rivulet or ſpring, and they are a kind of inns for the reception of travellers. There is generally a tent erected for their uſe, if they have not brought one along with them. They are accommodated with poultry, milk, and eggs, and with whatever is neceſſary for their horſes. Inſtead of wood for fuel, they have the cow-dung, which, when mixed with charcoal, makes a very briſk fire. The ſalts that abound in the vegetables of warm countries give this dung a conſiſtence which it has not perhaps in northern regions. A guard is always ſet on the tents of travellers, eſpecially if they are Europeans, becauſe the opinion of their wealth might tempt the avidity of the Moors, who are naturally inclined to thieving.

With reſpect to the roads, a very judicious policy is eſtabliſhed; which is adapted to the character of the Moors, and to their manner of life. The douhars are reſponſible for robberies committed in their neighbourhood and in ſight of their tents: they are not only obliged to make reſtitution, but it gives the ſovereign a pretence for exacting a contribution proportioned to the abilities of the douhar. In order to temper the rigour of this law, they are made reſponſible only for ſuch robberies as are committed during the day; thoſe that happen after ſun-ſet are not imputed to them, as they could neither ſee nor prevent them: on this account, people here travel only from ſun riſing to ſun-ſetting.

30 Markets. To facilitate the exchange of neceſſaries, there is in the fields every day except Friday, which is a day of prayer, a public market in the different quarters of each province. The Moors of the neighbourhood aſſemble to ſell and buy cattle, corn, pulſe, dried fruits, carpets, haicks, and in ſhort all the productions of the country. This market which is called *Soc*, reſembles our fairs. The buſtle of the people who go and come, gives a better idea of the manner of life of the Moors than can be had in the cities. The Alcaides, who command in the neighbourhood, always attend theſe markets with ſoldiers to keep the peace; as it frequently happens that the grudges which theſe tribes harbour againſt one another break out upon ſuch occaſions into open violence. The diſſolution of the ſoc is always the preſage of ſome ſeditious ſquabble. The ſkirts of theſe markets are commonly occupied by merry Andrews, ſingers, dancers, and other buffoons, who make apes dance to amuſe the idle. On one ſide are barbers and ſurgeons, to whom the ſick are brought to be cured.

31 Of the Moors who dwell in cities. The Moors who inhabit the cities differ from the others only in having a little more urbanity and a more eaſy deportment. Though they have the ſame origin with thoſe of the plains, they affect to decline all intercourſe with them. Some writers, without any foundation, have given the name of *Arabs* to the inhabitants of the towns, and that of *Moors* to thoſe of the plains. But the greater part of the cities of this empire are more ancient than the invaſion of the Arabs, who themſelves lived in tents.

32 Their houſes and furniture. The houſes in moſt of the towns in this empire appear at a little diſtance like vaulted tombs in a church-yard; and the entrance into the beſt of them has but a mean appearance. The rooms are generally on the ground floor, and whitened on the outſide. As the roofs are quite flat, they ſerve as *verandos*, where the Mooriſh women commonly ſit for the benefit of the air; and in ſome places it is poſſible to paſs nearly over the whole town without having occaſion to deſcend into the ſtreet.

As the beſt apartments are all backwards, a ſtable, or perhaps ſomething worſe, is the place to which viſitors are firſt introduced. Upon entering the houſe, the ſtranger is either detained in this place or in the ſtreet till all the women are diſpatched out of the way; he is then allowed to enter a ſquare court into which four narrow and long rooms open by means of large folding doors, which as they have no windows, ſerve likewiſe to introduce light into the apartments. The court has generally in its centre a fountain; and if it is the houſe of a Moor of property, it is floored with blue and white chequered tiling. The doors are uſually painted of various colours in a chequered form, and the upper parts of them are frequently ornamented with very curious carved work. None of the chambers have fire-places; and their victuals are always dreſſed in the court-yard in an earthen ſtove heated with charcoal. When the viſitor enters the room where he is received by the maſter of the houſe, he finds him ſitting croſs-legged and barefooted on a mattreſs, covered with fine white linen, and placed on the floor or elſe on a common mat. This, with a narrow piece of carpeting, is in general the only furniture he will meet with in Mooriſh houſes, though they are not deſtitute of other ornaments. In ſome, for inſtance, he will find the walls decorated with looking-glaſſes of different ſizes; in others, watches and clocks in glaſs-caſes; and in ſome the apartments are hung with the ſkins of lions or tigers, or adorned with a diſplay of muſkets and ſabres. In the houſes of thoſe who live in the very firſt ſtyle, an European mahogany bedſtead, with one or two matreſſes, covered with fine white linen, is ſometimes placed at each end of the room. Theſe, however, are only conſidered as ornaments, as the Moors always ſleep on a mattreſs or a mat placed upon the floor, and covered only with their *haick* or perhaps a quilt.

As the law of Mahomet ſtrictly proſcribes the uſe of pictures of every deſcription, this delightful ſpecies of ornament finds no place in the houſes of the Moors.

33 Dreſs of the men. The wardrobe of the inhabitants of cities is but little different from that of thoſe who live in tents.—Like the latter, they have a haick, and a hood more or leſs fine, and have alſo a hood of coarſe European cloth of dark blue for the winter. What farther diſtinguiſhes them from the country Moors is, that they wear a ſhirt and linen drawers, and an upper garment of cotton in ſummer, and of cloth in winter, which they call a *caftan*. The white or blue hood, the purpoſe of which ſeems to be to guard againſt bad weather, and which is called *bernus*, is likewiſe a ceremonial part of dreſs; without which, together with ſabre and canjer (or dagger) worn in a bandelier, perſons of condition never appear before the emperor.—Obliged as they are to conceal their riches, the Moors wear no jewels; very few have ſo much as a ring, a watch, or a ſilver ſnuff-box. They frequently carry a

roſary in their hand, but without annexing any ideas of devotion to the practice, although they uſe it to recite the name of God a certain number of times in the day. After theſe momentary prayers they play with their roſary much the ſame as the European ladies do with their fans. The Mooriſh women ſeldom leave the houſe, and when they do, are always veiled. The old very carefully hide their faces, but the young and handſome are ſomewhat more indulgent, that is to ſay toward foreigners, for they are exceedingly cautious with the Moors. Being veiled, their huſbands do not know them in the ſtreet, and it is even impolite to endeavour to ſee the faces of the women who paſs; ſo different are the manners and cuſtoms of nations. There are very fine women found among the Moors, eſpecially up the country; thoſe of the northern parts by no means poſſeſs the ſame degree of grace and beauty. As females in warm countries ſooner arrive at puberty, they are alſo ſooner old; and this perhaps may be the reaſon why polygamy has been generally adopted in ſuch climates. Women there ſooner loſe the charms of youth, while men ſtill preſerve their paſſions and the powers of nature. The Mooriſh women are not in general very reſerved. Climate has a vaſt influence on the temperament of the body; and licentiouſneſs is there more general and leſs reſtrained, tho' as in other places its diſorderly pleaſures incur its attendant pains; not but that the diſeaſe attending illicit amours is leſs poiſonous, and ſlower in its operations, among the Moors than in Europe becauſe of the heat of the climate, and the great temperance of their mode of living. The women of the ſouth are in general the handſomeſt, and are ſaid to be ſo reſerved, or ſo guarded, that their very relations do not enter their houſes nor their tents. Yet ſuch is the contradictory cuſtom of nations, that there are tribes in theſe ſame provinces among whom it is held to be an act of hoſpitality to preſent a woman to a traveller. It may be there are women who dedicate themſelves to this ſpecies of devotion as to an act of benevolence; for it is impoſſible to deſcribe all the varieties of opinion among men, or the whims to which the human fancy is ſubject.

34 Dreſs of the ladies.

The Mooriſh women who live in cities are, as in other nations, more addicted to ſhew and finery in dreſs than thoſe of the country; but as they generally leave the houſe only one day in the week, they ſeldom dreſs themſelves. Not allowed to receive male viſitors, they remain in their houſes employed in their families, and ſo totally in diſhabille that they often wear only a ſhift, and another coarſer ſhift over the firſt, tied round their waiſt, with their hair plaited, and ſometimes with, though often without, a cap. When dreſſed, they wear an ample and fine linen ſhift, the boſom embroidered in gold; a rich caftan of cloth, ſtuff, or velvet, worked in gold; and one or two folds of gauze, ſtreaked with gold and ſilk, round the head, and tied behind ſo as that the fringes, intermingled with their treſſes deſcend as low as the waiſt; to which ſome add a ribband of about two inches broad, worked in gold or pearls, that encircles the forehead in form of a diadem. Their caftan is bound round their waiſt by a crimſon velvet girdle, embroidered in gold with a buckle of gold or ſilver, or elſe a girdle of tamboured ſtuff, manufactured at Fez.

The women have yellow ſlippers, and a cuſtom of wearing a kind of ſtocking of fine cloth ſomewhat large, which is tied below the knee and at the ancle, over which it falls in folds. This ſtocking is leſs calculated to ſhow what we call a handſome leg, than to make it appear thick; for to be fat is one of the rules of beauty among the Mooriſh women. To obtain this quality, they take infinite pains, feed when they become thin on a diet ſomewhat like forced-meat balls, a certain quantity of which is given them daily; and, in fine, the ſame care is taken among the Moors to fatten young women as is in Europe to fatten fowls. The reaſon of a cuſtom like this may be found in the nature of the climate and the quality of the aliments, which make the people naturally meagre. Our ſlender waiſts and fine turned ankles would be imperfections in this part of Africa, and perhaps over all that quarter of the globe; ſo great is the contraſt of taſte, and ſo various the prejudices of nations.

The Moors preſent their wives with jewels of gold, ſilver, or pearl, but very few wear precious ſtones; this is a luxury of which they have little knowledge. They have rings in ſilver or gold; alſo ear-rings in the form of a creſcent, five inches in circumference, and as thick as the end of the little finger. They firſt pierce their ears, and introduce a ſmall roll of paper, which they daily increaſe in thickneſs, till at length they inſert the kernel of the date, which is equal in ſize to the ear-ring. They wear bracelets in gold and ſolid ſilver, and ſilver rings at the bottom of their legs, ſome of them conſiderably heavy. The uſe of white paint is unknown among the Mooriſh women, and that of red but little. It is much more common to ſee them dye their eye-brows and eye-laſhes, which dye does not add to the beauty of the countenance, but conſiderably to the fire of the eyes. They trace regular features with henna, of a ſaffron colour, on their feet, the palm of the hand, and the tip of their fingers.—On their viſiting day they wrap themſelves in a clean fine haick, which comes over the head, and ſurrounds the face ſo as to let them ſee without being ſeen.—When they travel, they wear ſtraw hats to keep off the ſun; and in ſome parts of the empire the women wear hats on their viſits; which is a faſhion peculiar to the tribes coming from the ſouth, who have preſerved their cuſtoms; for the Moors do not change modes they have once adopted.

35 Negroes.

The *Negroes*, who conſtitute a large proportion of the emperor's ſubjects, and the occaſion of whoſe introduction to this empire has been already mentioned, are better formed than the Moors; and as they are more lively, daring, and active, they are entruſted with an important ſhare in the executive part of government. They conſtitute in fact the moſt conſiderable part of the emperor's army, and are generally appointed to the command of provinces and towns. This circumſtance naturally creates a jealouſy between them and the Moors, the latter conſidering the negroes as uſurpers of a power which they have no right to aſſume. Beſides thoſe negroes which form the emperor's army, there are a great many others in the country, who either are or have been ſlaves to private Moors: every Moor of conſequence, indeed, has his proportion of them in his ſervice. To the diſgrace of Europe, the Moors treat their ſlaves with humanity, employing them in looking after their gardens, and in the domeſtic duties of their houſes. They allow them to marry among themſelves; and after a certain number of years, ſpontaneouſly preſent them with the invaluable boon of liberty. They ſoon are initiated in the Mahometan perſuaſion, though they ſometimes intermix with it a few of their original ſuperſtitious cuſtoms. In every other reſpect they copy the dreſs and manners of the Moors.

36 Renegadoes. Among the inhabitants of Morocco there is another claſs, of whom we muſt not omit to make mention. Theſe are the *Renegadoes*, or foreigners who have renounced their religion for the faith of Mahomet. Of theſe there are a great number who have been originally Jews: they are held in little eſtimation by the Moors; and would be held in abhorrence by the Jews, if they durſt freely expreſs their averſion. The families of theſe apoſtates are called *Toornadis:* not having at any time married with the Moors, they ſtill preſerve their ancient characteriſticks, and are known almoſt at ſight to be the progeny of thoſe who formerly embraced the Mahometan religion. The Chriſtian renegadoes are but few; and generally are fugitive peculators of Spain, or men fallen from power, who becauſe of their miſconduct, or in deſpair, quit one unfortunate ſituation for another much more deplorable.

37 Jews. The *Jews* were formerly very numerous in this empire. After being proſcribed in Spain and Portugal, multitudes of them paſſed over to Morocco, and ſpread themſelves through the towns and over the country. By the relations they themſelves give, and by the extent of the places aſſigned them to dwell in, it would appear there were more than 30,000 families, of whom at preſent there is ſcarcely a reſidue of one-twelfth; the remainder either having changed their religion, ſunk under their ſufferings, or fled from the vexations they endured, and the arbitrary taxes and tolls impoſed upon them. The Jews poſſeſs neither lands nor gardens, nor can they enjoy their fruits in tranquillity; they muſt wear only black; and are obliged, when they paſs near moſques or through ſtreets in which there are ſanctuaries, to walk barefoot. The loweſt among the Moors imagines he has a right to ill-treat a Jew: nor dares the latter defend himſelf, becauſe the koran and the judge are always in favour of the Mahometan.—Notwithſtanding this ſtate of oppreſſion, the Jews have many advantages over the Moors; they better underſtand the ſpirit of trade; they act as agents and brokers, and profit by their own cunning and the ignorance of the Moors. In their commercial bargains many of them buy up the commodities of the country to ſell again. Some have European correſpondents; and others are mechanics, ſuch as goldſmiths, tailors, gunſmiths, millers, and maſons. More induſtrious, artful, and better informed than the Moors, the Jews are employed by the emperor in receiving the cuſtoms, coining the money, and in all affairs and intercourſe which the monarch has with the European merchants, as well as in all his negociations with the various European governments.

38 State of knowledge among the Jews. The Moors, who derive their language and religion from the Arabs, ſeem not in any manner to have participated of their knowledge. United and confounded as theſe of Morocco have been with the Moors of Spain, the latter of whom cultivated the arts and gave birth to Averroes, and many other great men, the Moors of this empire have preſerved no traces of the genius of their anceſtors. They have no conception of the ſpeculative ſciences. Education conſiſts merely in learning to read and write; and as the revenues of the learned are derived from theſe talents, the prieſts and talbes among them are the ſole depoſitories of this much knowledge; the children of the Moors are taught in their ſchools to read and repeat ſome ſixty leſſons, ſelected from the Koran, which for the ſake of œconomy are written upon ſmall boards. Theſe leſſons being once learned, the ſcholar is ſuppoſed to have obtained ſufficient knowledge to leave ſchool; on this occaſion he rides on horſeback through the city, followed by his comrades, who ſing his praiſes: this to him is a day of triumph; to the ſcholars an incitement to emulation, a feſtival for the maſter, and a day of expence for the parents: for in all countries, wherever there are feſtivals and proceſſions, there alſo are eating and drinking. At Fez there is ſome ſmall degree more of inſtruction to be obtained in the ſchools; and the Moors who are a little wealthy ſend their children thither to have them inſtructed in the Arabic language, and in the religion and laws of their country. Here ſome of them alſo acquire a little taſte for poetry.

The Moors who formerly inhabited Spain gave great application to phyſic and aſtronomy; and they have left manuſcripts behind them which ſtill remain monuments of their genius. The modern Moors are infinitely degenerate; they have not the leaſt inclination to the ſtudy of Science; they know the properties of ſome ſimples; but as they do not proceed upon principle, and are ignorant of the cauſes and effects of diſeaſes, they generally make a wrong application of their remedies. Their moſt uſual phyſicians are their talbes, their fakirs, and their ſaints, in whom they place a ſuperſtitious confidence. Aſtronomy is entirely or almoſt unknown to the Moors: for though they likewiſe wander from place to place, there are few if any among them who have a knowledge of the motion of the heavens, or who are capable from principle to direct their own courſe by obſerving the courſe of the ſtars. They are therefore neceſſarily wholly unable to calculate the eclipſes, which they always interpret to portend evil.

Superſtitious people, indeed, have every where ſuppoſed eclipſes were ſent to preſage ſome calamity.—The Moors being unable to reaſon on the cauſes of ſuch an appearance, imagine the ſun or the moon are in the power of a dragon that ſwallows them; and they offer up prayers that theſe luminaries may be delivered from an enemy ſo cruel and voracious.

Notwithſtanding the Moors have occupied themſelves little in the ſtudy of aſtronomy they have been eager after aſtrology. This imaginary ſcience, which made ſo rapid a progreſs at Rome in deſpite of the edicts of the emperors, may be conceived to make ſtill greater advances among a people wholly ſtupid and ignorant, and ever agitated by the dread of preſent evils, or the hope of a more happy futurity. Magic, the companion of aſtrology, has here alſo found its followers, and is particularly ſtudied by the talbes in the ſouthern parts, who ſucceſsfully uſe it in impoſing upon

Mooriſh credulity with ſtrange dreams and ambiguous forebodings and propheſies.

In ſhort, arts and ſciences ſeem to be almoſt unknown in Morocco; or if at all cultivated, it is the only by the Jews, who indeed are the only induſtrious and ingenious people in the country. The Moors in general may be conſidered as exiſting in the paſtoral ſtate, following only a few mechanical trades, and leaving every thing that requires invention to the Jews, who have likewiſe the principal management of their commercial and pecuniary matters; and even thoſe few of the Moors who are merchants, are obliged to have Jew agents, for the purpoſe of tranſacting their buſineſs.

39 Manufactures and trades.

The Mooriſh manufactures are—The haick, which, as was before obſerved, is a long garment compoſed of white wool and cotton, or cotton and ſilk woven together, and is uſed by the Moors for the purpoſe of covering their under dreſs when they go abroad, which they do by totally wrapping themſelves in it in a careleſs but eaſy matter; ſilk handkerchiefs of a particular kind, prepared only at Fez; ſilks chequered with cotton; carpeting, little inferior to that of Turkey; beautiful matting, made of the palmetto or wild palm tree; paper of a courſe kind; cordovan, commonly called *Morocco leather;* gunpowder of an inferior nature; and long-barrelled muſkets, made of Biſcay iron. The Moors are unacquainted with the mode of caſting cannon; and therefore thoſe few which are now in the country are obtained from Europeans.—The manufacture of glaſs is likewiſe unknown to them; as indeed they make great uſe of earthen ware, and have few or no windows to their houſes, this commodity may be of leſs importance to them than many others. They make butter, by putting the milk into a goat-ſkin, with its outward coat turned inwards, and ſhaking it till the butter collects on the ſides, when it is taken out for uſe. From this operation it proves always full of hairs, and has an inſipid flavour. Their cheeſe conſiſts merely of curds hardened and dried, and has uniformly a diſagreeable taſte. The bread in ſome of the principal towns, particularly at Tangier and Sallee, is remarkably good, but in many other places it is coarſe, black, and heavy.

The Moors, agreeably to the Jewiſh cuſtom, cut the throats of all the animals they eat, at the ſame time turning their heads towards Mecca, in adoration of their prophet. After ſuffering them to bleed freely, they carefully waſh all the remaining blood away, and divide the meat in ſmall pieces, of about one or two pounds in weight. As they are unacquainted with the invention of pumps, and have but few ſprings, it affords employment to a number of indigent people, who would probably be idle otherwiſe, to carry water in ſkins from the neareſt river or reſervoir, and ſell it to the inhabitants. From their being obliged to tar the ſkins to prevent them from leaking, the water is frequently rendered very unpleaſant.

Their looms, forges, ploughs, carpenters tools, &c. are much upon the ſame conſtruction with the unimproved inſtruments of the ſame kind which are uſed at this time in ſome parts of Europe, only ſtill more clumſily finiſhed. In their work, they attend more to ſtrength than neatneſs or convenience; and, like all other ignorant people, they have no idea that what they do is capable of improvement. It is probable, indeed, that the Moors have undergone no very material change ſince the revolution in their arts and ſciences, which took place ſoon after their expulſion from Spain. Previous to that period, it is well known they were an enlightened people, at a time when the greater part of Europe was involved in ignorance and barbariſm; but owing to the weakneſs and tyranny of their princes, they gradually ſunk into the very oppoſite extreme, and may now be conſidered as but a few degrees removed from a ſavage ſtate.

They uſe no kind of wheel-carriage; and therefore all their articles of burden are tranſported from one place to another on camels, mules, or aſſes. Their buildings, though by no means conſtructed on any fixed principle of architecture, have at leaſt the merit of being very ſtrong and durable. The manner of preparing tabby, of which all their beſt edifices are formed, is the only remains of their ancient knowledge at preſent exiſting. It conſiſts of a mixture of mortar and very ſmall ſtones, beaten tight in a wooden caſe, and ſuffered to dry, when it forms a cement equal to the ſolid rock. There are always unaccountable diſcrepancies and inconſiſtencies in the arts of uncivilized nations. The apartments are, if poſſible, even more inconvenient than thoſe of their neighbours, the Spaniards; but the carved wood-work with which many of them are ornamented, is equal to any in Europe.

Their moſques or places of public worſhip are uſually large ſquare buildings, compoſed of the ſame materials as the houſes. The building conſiſts of broad and lofty piazzas, opening into a ſquare court, in a manner in ſome degree ſimilar to the Royal Exchange of London. In the centre of the court is a large fountain, and a ſmall ſtream ſurrounds the piazzas, where the Moors perform the ceremony of ablution.

40 Religious ceremonies.

The court and piazzas are floored with blue and white checquered tiling, and the latter are covered with matting, upon which the Moors kneel while repeating their prayers. In the moſt conſpicuous part of the moſque, fronting the eaſt, ſtands a kind of pulpit, where the talbe or prieſt occaſionally preaches. The Moors always enter this place of worſhip bare-footed, leaving their ſlippers at the door. On the top of the moſque is a ſquare ſteeple with a flag-ſtaff, whither at ſtated hours the talbe aſcends, hoiſts a white flag, and calls the people to prayers, for they have no bells. From this high ſituation the voice is heard at a conſiderable diſtance; and the talbes have a monotonous mode of enunciation, the voice ſinking at the end of every ſhort ſentence, which in ſome meaſure reſembles the ſound of a bell. The moment the flag is diſplayed, every perſon forſakes his employment, and goes to prayers. If they are near a moſque, they perform their devotions within it, otherwiſe immediately on the ſpot where they happen to be, and always with their faces towards the eaſt, in honour of their prophet Mahomet, who it is well known was buried at Medina. The prayer which is generally repeated on theſe occaſions, is a chapter from the Koran, acknowledging the goodneſs of God and Mahomet; and it is accompanied with various geſtures, ſuch as lifting the hands above the head, bowing twice, performing two genuflexions, proſtrations, bowing again twice, and kiſſing the ground. The whole of this ceremony they repeat three times.

Their ſabbath is on our Friday, and commences from ſix o'clock the preceding evening. On this day they uſe a blue flag inſtead of the white one. As it has been propheſied that they are to be conquered by the Chriſtians on the ſabbath-day, the gates of all the towns and of the emperor's palaces are ſhut when at divine ſervice on that day, in order to avoid being ſurpriſed during that period. Their talbes are not diſtinguiſhed by any particular dreſs.

The Moors have three ſolemn devotional periods in the courſe of the year. The firſt, which is named *Aid de Calier*, is held in commemoration of the birth of Mahomet. It continues ſeven days; during which period, every perſon who can afford the expence kills a ſheep as a ſacrifice, and divides it among his friends. The ſecond is the ***Ramadan***. This is held at the ſeaſon when Mahomet diſappeared in his flight from Mecca to Medino. Every man is obliged at that period to faſt (that is, to abſtain from animal-food from ſunriſe to ſun-ſet each day) for 30 days; at the expiration of which time a feaſt takes place, and continues a week. The third is named *Lhaſhare*, and is a day ſet apart by Mahomet for every perſon to compute the value of his property, in order for the payment of *zakat*, that is, one-tenth of their income to the poor, and other pious uſes. Although this feaſt only laſts a ſingle day, yet it is celebrated with far greater magnificence than either of the others.

The Moors compute time by lunar months, and count the days of the week by the firſt, ſecond, third, &c. beginning from our Sunday. They uſe a common reed for writing, and begin their manuſcripts from right to left.

41 Language of the Moors.

The moors of the empire of Morocco, as well as thoſe to the northern limits of Africa, ſpeak Arabic; but this language is corrupted in proportion as we retire farther from Aſia, where it firſt took birth; the intermixture which has happened among the African nations, and the frequent tranſmigrations of the Moors, during a ſucceſſion of ages, have occaſioned them to loſe the purity of the Arabic language; its pronunciation has been vitiated, the uſe of many words loſt, and other foreign words have been introduced without thereby rendering it more copious: the pronunciation of the Africans, however, is ſofter to the ear and leſs guttural than that of the Egyptians. The language, when written, is in effect much the ſame at Morocco as at Cairo, except that there are letters and expreſſions among the Moors which differ from thoſe of the Oriental Arabs, who, however, underſtand the Moors in converſation, notwithſtanding their vitiated manner of pronouncing. They mutually read each others writings with ſome difficulty.

There is a very ſenſible difference among the Moors between the Arabic of the learned and the courtiers, and that ſpoken by the people in general; and this difference is felt ſtill more in the provinces of the ſouth or of the eaſt, and among the Moors who live in the deſert, where the Arabic is yet further disfigured by a mixture of foreign tribes.

The Brebes and the Shellu, who appear to have had the ſame origin, for they have preſerved the ſame dialect, ſpeak a language which the Moors do not underſtand, and which ſeems to have no analogy with that of the latter. It has been conjectured to be the Punic, or the Numidian; but theſe people write it in Arabic characters. The Brebes count the days of the week like the Moors, and both of them employ Arabic words. The Shellu enumerate the days after the ſame method, but in their own language. Both the Brebes and the Shellu denote the months of the year in the ſame manner as do the Moors and Arabs, and date from the ſame æra; that is to ſay, from the year of the Hegira.

The Koran and books of prayer of the Brebes and Shellu are in Arabic; as likewiſe are their acts and title-deeds, which are written by their talbes or learned men.

42 Their temper and diſpoſition.

The Moors are naturally of a grave and penſive diſpoſition, fervid in profeſſions of friendſhip, but very inſincere in their attachments. They have no curioſity, no ambition of knowledge; an indolent habit, united to the want of mental cultivation, renders them perhaps even more callous than other unenlightened people to every delicate ſenſation; and they require more than ordinary excitement to render them ſenſible of pleaſure or of pain. This languor of ſentiment is, however, unaccompanied with the ſmalleſt ſpark of courage or fortitude. When in adverſity, they manifeſt the moſt abject ſubmiſſion to their ſuperiors; and in proſperity their tyranny and pride is inſupportable, They frequently ſmile, but ſeldom are heard to laugh loud. The moſt infallible mark of internal tranquillity and enjoyment is when they amuſe themſelves with ſtroking or playing with their beard. When rouſed by reſentment, their diſputes rarely proceed further than violently to abuſe each other in the moſt opprobrious language. They never fight or box with their fiſts like our peaſantry; but when a quarrel proceeds to great extremities, they collar each other, and ſometimes terminate a diſpute by aſſaſſination.

43 Mode of living, manners, &c.

Perſonal cleanlineſs has been conſidered as one of thoſe circumſtances which ſerve to mark and determine the civilization of a people. It was in vain that Mahomet enjoined the frequency of ablution as a religious duty to the Moors. Their dreſs, which ſhould be white, is but ſeldom waſhed; and their whole appearance evinces that they perform this branch of their religious ceremonies in but a ſlovenly manner. With this degree of negligence as to their perſons, we may be juſtly ſurpriſed to find united a moſt ſcrupulous nicety in their inhabitations and apartments. They enter their chambers barefooted, and cannot bear the ſlighteſt degree of contamination near the place where they are ſeated. This delicacy again is much confined to the inſides of their houſes. The ſtreets receive the whole of their rubbiſh and filth; and by theſe means the ground is ſo raiſed in moſt parts the city of Morocco, that the new buildings always ſtand conſiderably higher than the old.

When a Moor receives his gueſts, he never riſes from his ſeat, but ſhakes hands, inquires after their health, and deſires them to ſit down, either on a carpet or a cuſhion placed on the floor for that purpoſe. Whatever be the time of day, tea is then brought in on a tea-board with ſhort feet. This is the higheſt compliment that can be offered by a Moor; for tea is a very expenſive and ſcarce article in Barbary, and is only drank by the rich and luxurious. Their manner of preparing it is by putting ſome green tea, a ſmall quantity of tanſey, the ſame portion of mint, and a large proportion of ſugar (for the Moors drink their tea very ſweet) into the tea-pot at the ſame time, and filling it up with boiling water. When theſe articles are infuſed a proper time, the fluid is then poured into remarkably ſmall cups of the beſt India china, the ſmaller the more genteel, without any milk; and accompanied with ſome cakes or ſweetmeats, it is handed round to the company. From the great eſteem in which this beverage is held by the Moors, it is generally drank by very ſmall and ſlow ſips, that its flavour may be the longer enjoyed; and as they uſually drink a conſiderable quantity whenever it is introduced, this entertainment is ſeldom finiſhed in leſs time than two hours.

The other luxuries of the Moors are ſnuff, of which they are uncommonly fond, and ſmoking tobacco, for which the greater part uſe wooden pipes about four feet in length, with an earthen bowl; but the princes or emperor generally have the bowls made of ſolid gold. Inſtead of the indulgence of opium, which, from the heavy duty impoſed upon that article by the emperor, is too expenſive to be uſed by the Moors, they ſubſtitute the *achicha*, a ſpecies of flax. This they powder and infuſe in water in ſmall quantities. The Moors aſſert, that it produces agreeable ideas; but own that when it is taken to exceſs it moſt powerfully intoxicates. In order to produce this effect, they likewiſe mix with their tobacco an herb named in this country *khaf*, which by ſmoking, occaſions all the inebriating effects of the *achicha*. The uſe of ſpirits as well as wine is ſtrictly forbidden by the Koran; there are, however, very few among the Moors who do not joyfully embrace every private opportunity of drinking both to exceſs.

With reſpect to the hours for eating, the people of this country are remarkably regular. Very ſoon after day-break they take their breakfaſt, which is generally a compoſition of flour and water boiled thin, together with an herb which gives it a yellow tinge. The male part of the family eat in one apartment and the female in another. The children are not permitted to eat with their parents, but take their meals afterwards with the ſervants; indeed in moſt other reſpects they are treated exactly as ſervants or ſlaves by their parents. The meſs is put into an earthen bowl, and brought in upon a round wooden tray. It is placed in the centre of the gueſts, who ſit croſs-legged either on a mat or on the floor, and who form a circle for the purpoſe. Having previouſly waſhed themſelves, a ceremony always performed before and after meals, each perſon with his ſpoon attacks vigorouſly the bowl, while they diverſify the entertainment by eating with it fruit or bread. At 12 o'clock they dine; performing the ſame ceremonies as at breakfaſt. For dinner, from the emperor down to the peaſant, their diſh is univerſally *cooſcooſoo*, the mode of preparing which has been already deſcribed. The diſh is brought in upon a round tray and placed upon the floor, round which the family ſit as at breakfaſt, and with their fingers commit a violent aſſault on its contents: they are at the ſame time, however, attended by a ſlave or domeſtic, who preſents them with water and a towel occaſionally to waſh their hands. From the want of the ſimple and convenient invention of knives and forks, it is not uncommon in this country to ſee three or four people pulling to pieces the ſame piece of meat, and afterwards with their fingers ſtirring up the paſte or *cooſcooſoo*, of which they often take a whole handful at once into their mouth. At ſun-ſet they ſet upon the ſame diſh; and indeed ſupper is their principal meal.

Such is the general mode of living among the principal people in towns. There are conſiderable multitudes, however, who do not fare ſo well, but are obliged to content themſelves with a little bread and fruit inſtead of animal food, and to ſleep in the open ſtreets. This kind of exiſtence ſeems ill calculated to endure even in an active ſtate; far more ſevere muſt it therefore be to thoſe who exerciſe the laborious employment of couriers in this country, who travel on foot a journey of 300 or 400 miles at the rate of between 30 or 40 miles a-day, without taking any other nouriſhment than a little bread, a few figs, and water, and who have no better ſhelter at night than a tree. It is wonderful with what alacrity and perſeverance theſe people perform the moſt fatiguing journeys at all ſeaſons of the year. There is a regular company of them in every town, who are ready to be diſpatched at a moment's warning to any part of the country their employers may have occaſion to ſend them. They conſtitute in this empire the only mode of conveyance for all public and private diſpatches; and as they are well known in the place to which they belong, they are very punctual in delivering every thing that is put into their hands. From their ſteady pace in travelling, at the rate of about four miles an hour, and from their being able to paſs over parts which from the mountainous ſtate of the country, and from the want of good roads, perſons on horſeback would find inacceſſible, they are indeed by far the moſt expeditious meſſengers that could be employed.

As none but the very vulgar go on foot in this country, for the purpoſe of viſiting, mules are conſidered as more genteel than horſes; and the greateſt pride of a Moor is to have ſuch as walk remarkably faſt, and to keep his footmen, of which the number is proportionable to the rank and conſequence of the maſter, on a continued run.

As the Moors are not fond of admitting men into their houſes except upon particular occaſions, if the weather is fine they place a mat, and ſometimes a carpet, on the ground before their door, ſeat themſelves upon it croſs-legged, and receive their friends, who form a circle, ſitting in the ſame manner, with their attendance on the outſide of the groupe. Upon theſe occaſions they either drink tea or ſmoke and converſe. The ſtreets are ſometimes crowded with parties of this kind; ſome engaged in playing at an inferior kind of cheſs or drafts, at which they are very expert; but the majority in converſation. The people of this country, indeed, are ſo decidedly averſe to ſtanding up, or walking about, that if only two or three people meet, they ſquat themſelves down in the firſt clean place they can find, if the converſation is to held but for a few minutes.

The manner of ſalutation among the Moors is when two equals meet, by a quick motion they ſhake hands, and afterwards kiſs each other's hand. When an inferior meets a ſuperior, ſuch as an officer of rank, a judge, or governor, he kiſſes that part of his haick which covers the arm; and ſometimes, as a higher mark of reſpect, he will kiſs his feet. But the compliment due to the emperor, or any of the princes of the blood, is to take off the cap or turban, and to proſtrate the head to the ground. When two particular friends or relations meet, they anxiouſly embrace and kiſs each other's faces and beards for a few minutes, make a number of enquiries about the health of each party, as well as that of their families, but ſeldom allow time for a reply.

44
Their amuſements

The Moors have in general but few amuſements; the ſedentary life they lead in cities is little variegated except by the care they take of their gardens, which are rather kept for profit than pleaſure. Moſt of theſe gardens are planted with the orange, the lemon tree, and the cedar, in rows, and in ſuch great quantities, that the appearance is rather that of a foreſt than that of a garden. The Moors ſometimes, though rarely, have muſic in theſe retreats: a ſtate of ſlavery but ill agrees with the love of pleaſure: the people of Fez alone, either from a difference in education, or becauſe their organs and ſenſibility are more delicate, make muſic a part of their amuſements. There are not in Morocco, as in Turkey, public coffee-houſes, where people meet to enquire the news of the day; but inſtead of theſe, the Moors go to the barbers ſhops, which in all countries ſeem to be the rendezvous of Newſmongers. Theſe ſhops are ſurrounded by benches; on which the cuſtomer, the inquiſitive, and the idle, ſeat themſelves; and when there are no more places vacant, they crouch on the ground like monkeys.

Showmen and dancers come often into the towns; round whom the people aſſemble and partake of the amuſement for a very trifle. There are alſo a kind of wandering hiſtorians: the vulgar, who cannot read, and who every where are eager to hear extraordinary relations, are the more aſſiduous in attending theſe narrators, as want of more extenſive information prevents the tale-teller remaining above a week in a place.

A common diverſion in the towns where there are ſoldiers, as well as in the country, is what the Moors call the game of gun-powder; a kind of military exerciſe that is the more pleaſing to theſe people, inaſmuch as, by the nature of their government, they all are, or are liable to become, ſoldiers, therefore all have arms and horſes. By exploſions of powder, too, they manifeſt their feſtivity on their holidays. Their game of gun-powder conſiſts in two bodies of horſe, each at a diſtance from the other, galloping in ſucceſſive parties of four and four, and firing their pieces charged with powder. Their chief art is in galloping up to the oppoſite detachment, ſuddenly ſtopping, firing their muſkets, facing about, charging and returning to the attack; all which manœuvers are imitated by their opponents. The Moors take great pleaſure in this amuſement, which is only an imitation of their military evolutions.

45
Management of horſes.

The common topics for converſation among the Moors, are the occurrences of the place, religion, their women, but above all their horſes. This laſt topic, indeed, appears to occupy by far the greateſt portion of their attention. Theſe animals are ſeldom kept in ſtables in Morocco. They are watered and fed only once a-day, the former at one o'clock at noon, and the latter at ſun-ſet; and the only mode which they uſe to clean them is by waſhing them all over in a river two or three times a week, and ſuffering them to dry themſelves.

Notwithſtanding the attachment which the Moors manifeſt to their horſes, they moſt certainly uſe them with great cruelty. Their higheſt pleaſure, and one of their firſt accompliſhments, is, by means of long and ſharp ſpurs, to make the horſe go full ſpeed, and then to ſtop him inſtantaneouſly; and in this they certainly manifeſt uncommon dexterity. The iron-work of their bridles is ſo conſtructed, that by its preſſure on the horſe's tongue and lower jaw, with the leaſt exertion of the rider, it fills his mouth full of blood; and if not uſed with the utmoſt caution, throws him inevitably on his back. The bridle has only a ſingle rein, which is ſo very long, that it ſerves the purpoſe of both whip and bridle. The Mooriſh ſaddle is in ſome degree ſimilar to the Spaniſh, but the pummel is ſtill higher and more peaked. Their ſtirrups, in which they ride very ſhort, are ſo formed as to cover the whole of the foot. They either plate or gild them according to the dignity, opulence or fancy of the poſſeſſor. Their ſaddles which are covered with red woollen cloth, or if belonging to a perſon of conſequence with red ſatin or damaſk, are faſtened with a ſtrong girth round the body in the European ſtyle, and another round the ſhoulders. The Moors frequently amuſe themſelves by riding with the utmoſt apparent violence againſt a wall; and a ſtranger would conceive it impoſſible for them to avoid being daſhed to pieces, when juſt as the horſe's head touches the wall, they ſtop him with the utmoſt accuracy.

46
Love of muſic.

Like all other barbarous nations, the Moors are paſſionately fond of muſic, and ſome few have a taſte for poetry. Their ſlow airs for want of that variety which is introduced when the ſcience has attained a degree of perfection, have a very melancholy ſameneſs; but ſome of their quick tunes are beautiful and ſimple, and partake in ſome degree of the characteriſtic melody of the Scotch airs. The poetry of their ſongs, the conſtant ſubject of which is love, though there are few nations perhaps who are leſs ſenſible of that paſſion, has certainly leſs merit than the muſic.

Their inſtruments are a kind of hautboy, which differs from ours only in having no keys; the mandoline, which they have learnt to play upon from their neighbours the Spaniards; another inſtrument, bearing ſome reſemblance to a violin, and played upon in a ſimilar manner, but with only two ſtrings; the large drum, the common pipe, and the tabor. Theſe united, and accompanied with a certain number of voices, upon many occaſions form a band, though ſolo muſic is more common in this unſocial country. Upon all days of rejoicing, this kind of muſic, repeated volleys of muſketry, either by men on horſeback or on foot and in the evening a grand attack upon the cooſcooſo, conſtitute the principal part of the public entertainments.

The Moors marry very young, many of their females not being more than 12 years of age at their nuptials. As Mahometans, it is well known that their religion admits of polygamy to the extent of four wives, and as many concubines as they pleaſe: but if we except the very opulent, the people ſeldom avail themſelves of this indulgence, ſince it entails on them a vaſt additional expenſe in houſe-keeping, and in providing for a large family. In contracting marriage, the parents of both parties are the only agents: and the intended bride and bridegroom never ſee each other till the ceremony is performed. The marriage-ſettlements are made before the cadi, and then the friends of the bride produce her portion, or if not the huſband agrees to ſettle a certain ſum upon her in caſe he ſhould die, or divorce her on account of barrenneſs, or any other cauſe. The children of the wives have all an equal claim to the effects of the father and mother, but thoſe of the concubines can each only claim half a ſhare.

47
Marriage ceremonies

When the marriage is finally agreed upon, the bride is kept at home eight days, to receive her female friends, who pay congratulatory viſits every day. At the ſame time a talbe attends upon her, to converſe with her relative to the ſolemn engagement on which ſhe is about to enter; on theſe occaſions he commonly accompanies his admonitions with ſinging a pious hymn which is adapted to the ſolemnity. The bridegroom, on the other hand, receives viſits from his male friends in the morning, and in the evening rides through the town accompanied by them, ſome playing on hautboys and drums, while others are employed in firing volleys of muſketry. In all their feſtivals, the diſcharge of muſketry indeed forms a principal part of the entertainment. Contrary to the European mode, which particularly arms at firing with exactneſs, the Moors diſcharge their pieces as irregulary as poſſible, ſo as to have a continual ſucceſſion of reports for a few minutes.

On the day of the marriage, the bride in the evening is put into a ſquare or octagonal cage about 12 feet in circumference, which is covered with fine white linen and ſometimes with gauzes and ſilks of various colours. In this vehicle, which is placed on a mule, ſhe is paraded round the ſtreets, accompanied by her, relations and friends ſome carrying lighted torches, others playing on the hautboys, and a third party again firing volleys of muſketry. In this manner ſhe is carried to the houſe of her intended huſband, who returns about the ſame time from performing ſimilar ceremonies. On her arrival ſhe is placed in an apartment by herſelf, and her huſband is introduced to her alone for the firſt time, who finds her ſitting on a ſilk or velvet cuſhion, ſuppoſing her to be a perſon of conſequence, with a ſmall table before her, upon which are two wax candles lighted. Her ſhift, or more properly ſhirt, hangs down like a train behind her, and over it is a ſilk or velvet robe with cloſe ſleeves, which at the breaſt and wriſts is embroidered with gold; this dreſs reaches ſomething lower than the calf of the leg. Round her head is tied a black ſilk ſcarf, which hangs behind as low as the ground. Thus attired, the bride ſits with her hands over her eyes, when her huſband appears and receives her as his wife without any further ceremony; for the agreement made by the friends before the cadi, is the only ſpecific contract which is thought neceſſary.

If the huſband ſhould have any reaſon to ſuſpect that his wife has not been ſtrictly virtuous, he is at liberty to divorce her and take another. For ſome time after marriage, the family and the friends are engaged in much feaſting, and a variety of amuſements, which laſt a longer or ſhorter time according to the circumſtances of the parties. It is uſually cuſtomary for the man to remain at home eight days and the woman eight months after they are firſt married; and the woman is at liberty to divorce herſelf from her huſband, if ſhe can prove that he does not provide her with a proper ſubſiſtence. If he curſes her, the law obliges him to pay her, for the firſt offence eight ducats; for the ſecond, a rich dreſs of ſtill greater value; and the third time ſhe may leave him entirely. He is then at liberty to marry again in two months.

48
Circumciſion.

Women ſuffer but little inconvenience in this country from child-bearing; they are frequently up the next day, and go through all the duties of the houſe with the infant upon their backs. In celebrating the rite of circumciſion, the child is dreſſed very ſumptuouſly; and carried on a mule, or, if the parents are in poor circumſtances, on an aſs, accompanied with flags flying and muſicians playing on hautboys and beating drums. In this manner they proceed to the moſque, where the ceremony is performed.

49
Education of children.

Children as ſoon as they can be made in the leaſt degree uſeful, are put to the various kinds of labour adapted to their age and ſtrength. Others, whoſe parents are in better circumſtances, are ſometimes ſent to ſchool: and thoſe who are intended for the church, uſually continue their ſtudies till they have nearly learnt the Koran by rote. In that caſe they are enrolled among the talbes, or learned men of the law; and upon leaving ſchool are paraded round the ſtreets on a horſe, accompanied by muſic, and a large concourſe of people.

50
Funeral rites.

When any perſon dies, a certain number of women are hired for the purpoſe of lamentation; in the performance of which, nothing can be more grating to the ear, or more unpleaſant, than their frightful moans, or rather howlings; at the ſame time, theſe mercenary mourners beat their heads and breaſts, and tear their checks with their nails. The bodies are uſually buried a few hours after death. Previous to interment, the corpſe is waſhed very clean, and ſewed up in a ſhroud, with the right hand under the head, which is pointed towards Mecca, it is carried on a bier, ſupported upon mens ſhoulders, to the burying place, which is always, with great propriety, on the outſide of the town, for they never bury their dead in the moſques, or within the bounds of an inhabited place. The bier is accompanied by numbers of people, two a breaſt, who walk very faſt, calling upon God and Mahomet, and ſinging hymns adapted to the occaſion. The grave is made very wide at the bottom and narrow at the top, and the body is depoſited without any other ceremony than ſinging and praying in the ſame manner as on their way to the grave. They have no tombs in this country, but long and plain ſtones; and it is frequently cuſtomary for the female friends of the departed to weep over their graves for ſeveral days after their funeral.

51 Abſurd conduct of the European powers towards Morocco.

It has often been thought ſurpriſing, that the Chriſtian powers ſhould ſuffer their marine to be inſulted by thoſe barbarians, who take the ſhips of all nations with whom they are not at peace, or rather who do not pay them a ſubſidy either in money or commodities. This forbearance has been accounted for no otherwiſe than by ſuppoſing, firſt, that a breach with them might provoke the Porte, who pretends to be their lord paramount; ſecondly, that no Chriſtian power would be fond of ſeeing Algiers, and the reſt of that coaſt, in poſſeſſion of another; and, thirdly, that nothing could be got by a bombardment of any of their towns, as the inhabitants would inſtantly carry their effects to their deſerts and mountains, ſo that the benefit reſulting from the conqueſt muſt be tedious and uncertain.

The firſt reaſon is ſo obviouſly abſurd as to require no anſwer; in regard to the ſecond and third ſuppoſitions, it may be obſerved, that there is no neceſſity for taking poſſeſſion of thoſe coaſts by any European power whatever. The object ought to be, not to conquer, but to render impotent, thoſe piratical ſtates; not to profit by plundering them, but to quaſh their piracies, and prevent them from being longer the nuiſances and peſts of the Mediteranean. Than which according to the beſt informed travellers, there can be nothing more eaſy. Hardly any force of armament would be neceſſary for the purpoſe; would the Europeans merely leave them to their own reſources, and with-hold thoſe ſupplies with which they have been in uſe to furniſh them, contrary as well to good policy as to the intereſts of humanity. M. Lempriere †, ſpeaking of the emperor of Morocco (1790) obſerves, that "nothing but groſs neglect or inexcuſable ignorance could induce the European princes in general to remain in a kind of tributary ſtate to a prince who had neither an army nor a fleet which deſerved the name, and a people whoſe diſpoſition is leſs united to enterpriſe than perhaps any other. What had they to fear from him? His whole fleet conſiſted only of a few ſmall frigates and row-boats, ill managed and worſe manned, the whole of which might have been deſtroyed in one day by two or three well appointed European frigates. The entrances of thoſe ports where he laid up his ſhipping, if we except Tangier and Larache, are ſo continually choaking up with ſand, that in a ſhort time they will only admit fiſhing-boats, or the very ſmalleſt craft. The towns are none of them regularly fortified except Mogodore, and that hardly produces half a dozen of men who underſtand the leaſt of working the guns. And yet this contemptible power gives laws to all the coaſts of Portugal and Spain, and may be ſaid in ſome meaſure to command the entrance of the Mediterranean.

"It may be ſaid, he was too trifling a power to notice; if ſo, why laviſh immenſe preſents for the purpoſe of keeping him in temper? Thoſe who imagined they ſecured his friendſhip by theſe means, were much miſtaken; on the contrary, they only added fuel to that flame of avarice which was not to be extinguiſhed. If he was one day preſented with a frigate, he aſked for two the next; and the more his requeſts were indulged, the more his inordinate deſires were increaſed. It is well known to thoſe who have been converſant with the Moors, that to ſecure their friendſhip, you muſt firſt aſſert your own ſuperiority; and then if you make them a trifling preſent, its value, is trebled in their eſtimation. The ſame diſpoſition would have been found in the late emperor as in the common Moor. So far from courting an alliance, it would rather have been good policy at once to quarrel with him; the loſs of a few towns, and particularly Mogodore, to which he was much attached, from its being raiſed under his own auſpices, would ſoon have reduced him to good humour and ſubmiſſion."

Shipwreck of M. Briſſon.

Another intelligent traveller, M. Briſſon*, obſerves how extraordinary it is, that a prince ſo little to be dreaded as the emperor of Morocco ſhould oblige the different powers of Europe to ſend ambaſſadors to him, and that he ſhould even dictate laws to them. There is not a ſingle ſovereign who dares to ſend a repreſentative to his court without making him at the ſame time conſiderable preſents; and what envoy would preſent himſelf without having his hands full? How happens it that the conſuls have not by common conſent, repreſented to their reſpective ſovereigns, that the emperor of Morocco becomes every day more and more powerful by the ſupplies which they themſelves furniſh him? Twenty years ago this prince was abſolutely deſtitute of reſources. He had neither materials nor any place for caſting cannons; and he was equally in want of wood for building ſhips, of ropes, of nails, and even of workmen. It is France and other European powers that aſſiſt him, elſe the emperor of Morocco would be of little conſideration. His ſuperb batteries of braſs cannons, 24, 36, and 48 pounders, were furniſhed by Holland, Spain, England, and France. England has done more than other nations, by ſelling him thoſe beautiful cannons which were taken on the floating batteries. Mogodore is built in an advantageous ſituation, its batteries are well diſpoſed, and there are cannon at each embraſure; but they are there only in a manner for ſhow, as they have no carriages, and are ſupported only by brick-work. There are no workmen in the country capable of mounting them on carriages, nor is there wood proper for making them. Did a few veſſels only wait for the ſailing of thoſe ſmall frigates, which are almoſt all unfit for ſea except only two, nothing would be eaſier than to prevent them from returning, and to block up the ports of Mogodore, Rabat, and Sallee. What would become of his commerce, and above all his marine, did the Chriſtian princes ceaſe to aſſiſt him, contrary to the intereſts of humanity? Would England and Spain unite only for a moment, Tangiers, his moſt beautiful port, would ſoon be ſo far ruined, that it could not afford ſhelter to his ſubjects, who, deſtitute of ſhips, would ſoon be obliged to give over their piracies. If the conſuls of different nations have never made theſe obſervations, and if they have never pointed out the means of curbing the inſolence of the emperor of Morocco, it is becauſe they are at the head of the commerce which theſe different powers carry on in that part of the world. I can poſitively aſſert, that theſe repreſentatives, inſtead of furniſhing their courts with the means of diminiſhing the power of the emperor, never ceaſe to add to his ſtrength, and to incite him to make

52 Avarice and intrigues of their conſuls.

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† Tour, p. 233.

new pretenſions. How much we aſſiſt theſe pirates, to hurt the advantageous trade which we might carry on? Their ſituation renders them very dangerous; but if we leave them only their ſituation, it would be impoſſible for them to profit much by it. Let impartial people pay a viſit to that country, let them ſpeak with the ſame ſincerity as I do; and they will no doubt be convinced, that the emperor of Morocco, of all the princes in the world, would be the leaſt able to do miſchief, did the ſovereigns of Europe ceaſe to furniſh him with ſuccours."

53 Deſcription of the city of Morocco.

Morocco, a city of the kingdom of Morocco in Barbary, lying about 120 miles to the north of Tarudant, 90 to the eaſt of Mogodore, and 350 to the ſouth of Tangier. It is ſituated in a beautiful valley, formed by a chain of mountains on the northern ſide, and thoſe of the Atlas, from which it is diſtant about 20 miles on the ſouth and eaſt. The country which immediately ſurrounds it is a fertile plain, beautifully diverſified with clumps of palm trees and ſhrubs, and watered by ſmall and numerous ſtreams which deſcend from Mount Atlas. The emperor's out-gardens, which are ſituated at the diſtance of about five miles to the ſouth of the city, and are large plantations of olives walled in, add conſiderably to the beauty of the ſcene.

Morocco, though one of the capitals of the empire (for there are three, Morocco, Mequinez, and Fez), has nothing to recommend it but its great extent and the royal palace. It is encloſed by remarkably ſtrong walls built of tabby, the circumference of which is about eight miles. On theſe walls there are no guns mounted; but they are flanked with ſquare towers, and ſurrounded by a wide and deep ditch. The city has a number of entrances, conſiſting of large double porches of tabby in the Gothic ſtyle, the gates of which are regularly ſhut every night at certain hours. As polygamy is allowed by the Mahometan religion, and is ſuppoſed in ſome degree to affect population, it would be difficult to form any computation near the truth with reſpect to the number of inhabitants which this city may contain. The moſques, which are the only public buildings, except the palace worth noticing at Morocco, are more numerous than magnificent; one of them is ornamented with a very high and ſquare tower, built of cut ſtone, which is viſible at a conſiderable diſtance from the city. The ſtreets are very narrow, dirty and irregular, and many of the houſes are uninhabited and falling to ruin. Thoſe which are decent and reſpectable in their appearance are built of tabby, and encloſed in gardens. That of the effendi or prime miniſter (according to Mr Lempriere, from whoſe *Tour* * this account is tranſcribed), was among the beſt in Morocco. This houſe, which conſiſted of two ſtories, had elegant apartments both above and below, furniſhed in a ſtyle far ſuperior to any thing our author ever ſaw in that country. The court, into which the lower apartments opened, was very neatly paved with glazed blue and white tiling, and had in its centre a beautiful fountain. The upper apartments were connected together by a broad gallery, the balluſters of which were painted of different colours. The hot and cold baths were very large, and had every convenience which art could afford. Into the garden, which was laid out in a tolerably neat ſtyle, opened a room adjoining to the houſe, which had a broad arched entrance but no door, beautifully ornamented with chequered tiling; and at both ends of the apartment the walls were entirely covered with looking-glaſſes. The flooring of all the rooms was covered with beautiful carpeting, the walls ornamented with large and valuable looking glaſſes, intermixed with watches and clocks in glaſs-caſes. The ceiling was carved wood-work, painted of different colours; and the whole was in a ſuperior ſtyle of Mooriſh grandeur. This and a few others are the only decent habitations in Morocco. The generality of them ſerve only to impreſs the traveller with the idea of a miſerable and deſerted city.

The Elcaiſſeria is a particular part of the town where ſtuffs and other valuable articles are expoſed to ſale. It conſiſts of a number of ſmall ſhops, formed in the walls of the houſes, about a yard from the ground, of ſuch an height within as juſt to admit a man to ſit in one of them croſs-legged. The goods and drawers are ſo arranged round him, that when he ſerves his cuſtomers, who are ſtanding all the time out in the ſtreet, he can reach down any article he wants without being under the neceſſity of moving. Theſe ſhops, which are found in all the other towns of the empire, are ſufficient to afford a ſtriking example of the indolence of the Moors. There are three daily markets in different parts of the town of Morocco where proviſions are ſold, and two weekly fairs or markets for the diſpoſal of cattle. The city is ſupplied with water by means of wooden pipes connected with the neighbouring ſtreams, which empty themſelves into reſervoirs placed for the purpoſe in the ſuburbs, and ſome few in the centre of the town.

The caſtle is a large and ruinous building, the outer walls of which encloſe a ſpace of ground about three miles in circumference. It has a moſque on the top of which are three large balls, formed, as the Moors allege, of ſolid gold. The caſtle is almoſt a town of itſelf; it contains a number of inhabitants, who in ſome department or other are in the ſervice of the emperor, and all under the direction of a particular alcaide, who is quite independent of the governor of the town. On the outſide of the caſtle, between the Mooriſh town and the Jewdry are ſeveral ſmall diſtinct pavilions, incloſed in gardens of orange trees, which are intended as occaſional places of reſidence for ſuch of the emperor's ſons or brothers as happen to be at Morocco. As they are covered with coloured tiling, they have at a ſmall diſtance rather a neat appearance; but upon approaching or entering them, that effect in a great meaſure ceaſes.

The Jews, who are at this place pretty numerous, have a ſeparate town to themſelves, walled in, and under the charge of an alcaide, appointed by the emperor. It has two large gates, which are regularly ſhut every evening about nine o'clock; after which time no perſon whatever is permitted to enter or go out of the Jewdry till they are opened again the following morning. The Jews have a market of their own; and when they enter the Mooriſh town, caſtle, or palace, they are always compelled to be bare footed.

The palace, is an ancient building, ſurrounded by a ſquare wall, the height of which nearly excludes from the view of the ſpectator the other buildings. Its principal gates are conſtructed with Gothic arches, compoſed of cut ſtone, which conduct to ſeveral open and ſpacious courts; through theſe it is neceſſary to paſs before we reach any of the buildings. Theſe open courts were uſed by the late emperor for the purpoſes of tranſacting public buſineſs and exerciſing his troops. The habitable part conſiſts of ſeveral irregular ſquare pavilions, built of tabby, and whitened over; ſome of which communicate with each other, others are diſtinct, and moſt of them receive their names from the different towns of the empire. The principal pavillion is named by the Moors the *douhar*, and is more properly the palace or ſeraglio than any of the others. It conſiſts of the emperor's place of reſidence and the harem, forming altogether a building of conſiderable extent. The other pavilions are merely for the purpoſes of pleaſure or buſineſs, and are quite diſtinct from the douhar. The *Megodore* pavilion ſo named from the late emperor's partiality to that town, has by far the faireſt claim to grandeur and magnificence. This apartment was the work of Sidi Mahomet, and is lofty and ſquare. It is built of cut ſtone, handſomely ornamented with windows, and covered with varniſhed tiles of various colous; and its elegance and neatneſs, contraſted altogether with the ſimplicity and irregularity of the other buildings, produce a moſt ſtriking effect. In the inſide, beſides ſeveral other apartments, we find in the pavilion a ſpacious room floored with blue and white chequered tiling, its ceiling covered with curiouſly carved and painted wood, and its ſtuccoed walls variouſly ornamented with looking glaſſes and watches, regularly diſpoſed in glaſs-caſes. To this pavilion the late emperor manifeſted an excluſive preference, frequently retiring to it both for the purpoſes of buſineſs and of recreation. The apartments of the emperor have in general a much ſmaller complement of furniture than thoſe of the Moors in the inferior walks of life. Handſome carpeting, a matreſs on the ground covered with fine linen, a couch, and a couple of European bedſteads, are the principal articles they contain. The gardens within the walls of the palace, of which he has ſeveral, are very neat; they contain orange and olive trees, variouſly diſpoſed and arranged, and interſected with ſtreams of water, fountains, and reſervoirs. Thoſe on the outſide are nothing more than large tracts of ground, irregularly planted with olives; having four ſquare walks, and ſurrounded by walls

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* Publiſhed in 1791.

Morocco or *Marroquin*, the ſkin of a goat, or ſome other animal reſembling it, dreſſed in ſumac or galls, and coloured of any colour at pleaſure; much uſed in bookbinding, &c. The name is ordinarily derived from the kingdom of Morocco, whence it is ſuppoſed the manner of preparing theſe ſkins was firſt borrowed. There are Morocco ſkins brought from the Levant, Barbary, Spain, Flanders, and France; red black, yellow, blue, &c. For the manner of preparing them, ſee Leather.

MOROCHTHUS, in natural hiſtory, an indurated clay called by us *French chalk*; ſerving taylors and others to mark with. The ancients eſteemed it as an aſtringent, preſcribing it in the cholic, hæmorrhagies, and other fluxes.

MORON, a town of Spain, in Andaluſia, ſeated in a pleaſant fertile plain, and in the neighbourhood is a mine of precious ſtones. It is 30 miles ſouth-eaſt of Seville. W. Long. 5. 20. N. Lat. 37. 0.

MORPETH, a handſome town of Northumberlond, 14 miles from Newcaſtle, 286 miles from London, is an ancient borough by preſcription, with a bridge over the Wanſbeck. It had once an abbey and a caſtle, now in ruins, ſituated about a quarter of a mile ſouth of the town and river Wanſbeck, on an eminence which overlooks them both. The market-place is conveniently ſituated near the centre of the town; and an elegant town-houſe was built by the Carliſle family in 1714, in which the quarter-ſeſſions is held for the county. It it built of hewn-ſtone, with a piazza. The church being a quarter of a mile diſtant from the town, a tower containing a good ring of bells ſtands near the market-place. Near the bridge is the county gaol, a modern ſtructure. Here are a free grammar-ſchool, a chapel near the river on the ſcite of a chantry that was granted for the ſupport of the foundation of the ſchool, which was part of the old ſtructure, and an hoſpital for infirm people. In 1215, the townſmen themſelves burnt their town, out of pure hatred to king John, that he migh find no ſhelter there. Here is a good market on Saturday for corn, cattle, and all neceſſary proviſions; and there is another on Wedneſday, the greateſt in England except Smithfield, for live cattle. This is a poſt town and a thoroughfare, with many good inns, and plenty of fiſh; and here are ſeveral mills.—The earl of Carliſle's ſteward holds a court here twice a-year, one of them the Monday after Michaelmas, when four perſons are choſen by the free burgeſſes, who are about 107, and preſented to the ſteward, who names two of them to the bailiffs, who, with ſeven aldermen, are its governors for the year enſuing. Its fairs are on Wedneſday, Thurſday, and Friday before Whitſunday, and the Wedneſday before July 22. It ſends two members to parliament.

MORPHEUS, in fabulous hiſtory, the god of ſleep, or, according to others, one of the miniſters of Somnus. He cauſed ſleepineſs, and repreſented the forms of dreams. Ovid ſtyles him the kindeſt of the deities; and he is uſually deſcribed in a recumbent poſture, and crowned with poppies.

MORRERI (Lewis), author of the Hiſtorical Dictionary, was born at Bargemont in Provence, 1643. He learned rhetoric and philoſophy at Aix, and divinity at Lyons. At 18 years of age he wrote a ſmall piece, intitled *Le pays d'Amour*, and a collection of the fineſt French poems intitled *Doux plaiſirs de la Poeſie*. He learned Spaniſh and Italian; and tranſlated out of Spaniſh into French the book intitled *La Perfection Chretienne de Rodriguez*. He then refined the Saints Lives to the purity of the French tongue. Being ordained prieſt, he preached at Lyons, and undertook, when he was but 30 years of age, a new Hiſtorical Dictionary, printed at Lyons in one vol. folio, 1673. But his continual labour impaired his health; ſo that he died in 1680, aged 37. His ſecond volume was publiſhed after his death; and four more volumes have ſince been added. He left ſome other works behind him.

MORRHINA vasa, were a ſort of cups or vaſes made uſe of by the ancients for drinking out of, and

Morriſe ‖ Mortality.

other purpoſes. Anthors are not agreed as to the ſubſtance of which they were made. Some ſay it was a ſtone; ſome aſſert that it was a fluid condenſed by being buried under ground. All that we know concerning it is, that it was known by the name of *Murrha*, and that Heliogabalus's chamber pot was made of it. The word is ſometimes written *myrrhina*.

MORRISE-DANCES. See *Morisque-Dances*.

MORS, DEATH, one of the infernal deities, born of Night without a father. She was worſhipped by the ancients with great ſolemnity. She was not repreſented as an actually exiſting power, but as an imaginary being. Euripides introduces her in one of his tragedies on the ſtage. The moderns repreſent her as a ſkeleton armed with a ſcythe and a ſcymetar.

MORSE, in zoology. See TRICHECUS.

MORTALITY, a term frequently uſed to ſignify a contagious diſeaſe, which deſtroys great numbers of either men or beaſts.

Bills of MORTALITY, are accounts or regiſters ſpecifying the numbers born, married, and buried in any pariſh, town or diſtrict. In general they contain only theſe numbers; and, even when thus limited, are of great uſe, by ſhowing the degrees of healthineſs and prolifickneſs, and the progreſs of population in the places where they are kept. It is therefore much to be wiſhed, that ſuch accounts had been always correctly kept in every kingdom, and regularly publiſhed at the end of every year. We ſhould then have had under our inſpection the comparative ſtrength of every kingdom, as far as it depends on the number of inhabitants, and its increaſe or decreaſe at different periods. But ſuch accounts are rendered more uſeful, when they include the ages of the dead, and the diſtempers of which they have died. In this caſe they convey ſome of the moſt important inſtructions, by furniſhing us with the means of aſcertaining the law which governs the waſte of human life, the values of annuities dependent on the continuance of any lives, or any ſurvivorſhips between them, and the favourableneſs or unfavourableneſs of different ſituations to the duration of human life. There are but few regiſters of this kind; nor has this ſubject, though ſo intereſting to mankind, ever engaged much attention till lately. The firſt bills containing the ages of the dead were thoſe for the town of Breſlaw in Sileſia. It is well known what uſe has been made of theſe by Dr Halley, and after him by De Moivre. A table of the probabilities of the duration of human life at every age, deduced from them by Dr Halley, has been publiſhed in the Philoſophical Tranſactions, (ſee the Abridgement, vol. iii. p. 669.) and is the firſt table of this ſort that has ever been publiſhed. Since the publication of this table, ſimilar bills have been eſtabliſhed in a few towns of Great Britain, particularly in London, in the year 1728, and at Northampton in 1735.

Two improvements of theſe regiſters have been propoſed: the firſt is, that the ſexes of all that die in every period of life ſhould be ſpecified in them, under the denomination of *boys, married men, widowers*, and *batchelors*; and of *girls, married women, widows*, and *virgins*. The ſecond is, that they ſhould ſpecify the numbers of both ſexes dying of every diſtemper in every month, and at every age. See the end of the 4th eſſay in Dr Price's Treatiſe on Reverſionary Payments. Mortality. Regiſters of mortality thus improved, when compared with records of the ſeaſons, and with the circumſtances that diſcriminate different ſituations, might contribute greatly to the increaſe of medical knowledge; and they would afford the neceſſary data for determining the difference between the duration of human life among males and females; for ſuch a difference there certainly is much in favour of females, as will appear from the following facts.

At Northampton, though more males are born than females, and nearly the ſame number die; yet the number of living females appeared, by an account taken in 1746, to be greater than the number of males, in the proportion of 2301 to 1770, or 39 to 30.

At Berlin it appeared, from an accurate account which was taken of the inhabitants in 1747, that the number of female citizens exceeded the number of male citizens in the proportion of 459 to 391. And yet out of this ſmaller number of males, more had died for 20 years preceding 1751, in the proportion of 19 to 17.

At Edinburgh, in 1743, the number of females, was to the number of males as 4 to 3. (See Maitland's Hiſtory of Edinburgh, p. 220.) But the females that died annually from 1749 to 1758, were to the males in no higher proportion than $3\frac{1}{7}$ to 3.

He that will take the pains to examine the accounts in Phil. Tranſ. abr. vol. vii. part iv. p. 46, &c. will find, that though in the towns there enumerated, the proportion of males and females born is no higher than 19 to 18, yet the proportion of boys and girls that die is 8 to 7; and that, in particular, the ſtill born and chryſom males are to the ſtill-born and chryſom females as 3 to 2.

In 39 pariſhes of the diſtrict of Vaud in Switzerland, the number of males that died during ten years before 1766 was 8170; of females 8167; of whom the numbers that died under one year of age were 1817 males and 1305 females; and under ten years of age, 3099 males and 2598 females. In the beginning of life, therefore, and before any emigrations can take place, the rate of mortality among males appears to be greater than among females. And this is rendered yet more certain by the following accounts. At Vevey, in the diſtrict of Vaud juſt mentioned, there died in the courſe of 20 years, ended at 1764, in the firſt month after birth, of males 135 to 89 females; and in the firſt year 225 to 162. To the ſame effect it appears from a table given by Suſmilch, in his Gottliche Ordnung, vol. ii. p. 317, that in Berlin 203 males die in the firſt month, and but 168 females; and in the firſt year, 489 to 395; and alſo, from a table of Struycks, that in Holland 396 males die in the firſt year to 300 females.

The authorities for the facts here mentioned, and much more on this ſubject, may be found in the 4th eſſay in Dr Price's Treatiſe on Reverſionary Payments, and in the ſupplement at the end of that treatiſe.

We ſhall here only add the following table, taken from a memoir of Mr Wargentin's, publiſhed in the collection of the Memoirs of the Royal Academy of Sciences at Stockholm, printed at Paris in 1772.

In all Sweden for nine years, ended in 1763, the proportion of females to males that died out of a given number living, was

Under the age of one year	—	1000 to	1099
From 1 to 3 years of age	—	1000	1022
3 5	——	——	1042
5 10	——	——	1074
10 15	——	——	1080
15 20	——	——	1097
20 25	——	——	1283
25 30	——	——	1161
30 35	——	——	993
35 40	——	——	1159
40 45	——	——	1115
45 50	——	——	1340
50 55	——	——	1339
55 60	——	——	1292
60 65	——	——	1115
65 70	——	——	1080
70 80	——	——	1022
80 90	——	——	1046
Above 90	——	——	1044

Regiſters of mortality on the improved plan before mentioned, were eſtabliſhed in 1772 at Cheſter, and alſo in 1773 at Warrington in Lancaſhire; and they are ſo comprehenſive and correct, that there is reaſon to expect they will afford much inſtruction on the ſubject of human mortality, and the value of lives.

But the country moſt diſtinguiſhed in this reſpect is Sweden: for in that kingdom exact accounts are taken of the births, marriages, and burials, and of the numbers of both ſexes that die at all ages in every town and diſtrict, and alſo at the end of every period of five years, of the numbers living at every age: and at Stockholm a ſociety is eſtabliſhed, whoſe buſineſs it is to ſuperintend and regulate the enumerations, and to collect from the different parts of the kingdom the regiſters, in order to digeſt them into tables of obſervations. Theſe regulations were begun in Sweden in 1755; and tables, containing the reſult of them from 1755 to 1763, have been publiſhed in Mr Wargentin's memoir juſt referred to; and the moſt material parts of them may be found in an eſſay by Dr Price on the Difference between the Duration of Human Life in Towns and in Country Pariſhes, printed in the 65th volume of the Philoſoph. Tranſ. Part ii.

In the fourth eſſay in Dr Price's Treatiſe on Reverſionary Payments and Life-Annuities, the following account is given of the principles on which tables of obſervation are formed from regiſters of mortality; and of the proper method of forming them, ſo as to render them juſt repreſentations of the number of inhabitants, and the probabilities of the duration of human life in a town or country.

In every place which juſt ſupports itſelf in the number of its inhabitants, without any recruits from other places; or where, for a courſe of years, there has been no increaſe or decreaſe; the number of perſons dying every year at any particular age, and above it, muſt be equal to the number of the living at that age. The number, for example, dying every year at all ages from the beginning to the utmoſt extremity of life, muſt, in ſuch a ſituation, be juſt equal to the whole number born every year. And for the ſame reaſon, the number dying every year at one year of age and upwards, at two years of age and upwards, at three and upwards, and ſo on, muſt be equal to the numbers that attain to thoſe ages every year; or, which is the ſame, to the numbers of the living at thoſe ages. It is obvious, that unleſs this happens, the number of inhabitants cannot remain the ſame. If the former number is greater than the latter, the inhabitants muſt decreaſe; if leſs, they muſt increaſe. From this obſervation it follows, that in a town or country where there is no increaſe or decreaſe, bills of mortality which give the ages at which all die, will ſhow the exact number of inhabitants, and alſo the exact law according to which human life waſtes in that town or country.

In order to find the number of inhabitants, the mean numbers dying annually at every particular age and upwards muſt be taken as given by the bills, and placed under one another in the order of the ſecond column of the following tables. Theſe numbers will, it has appeared, be the numbers of the living at 1, 2, 3, &c. years of age; and conſequently the ſum diminiſhed by half the number born annually will be the whole number of inhabitants.

This ſubtraction is neceſſary for the following reaſon. In a table formed in the manner here directed, it is ſuppoſed that the numbers in the ſecond column are all living together at the beginning of every year. Thus the number in the ſecond column oppoſite to 0 in the firſt column, the table ſuppoſes to be all juſt born together on the firſt day of the year. The number, likewiſe, oppoſite to 1, it ſuppoſes to attain to one year of age juſt at the ſame time that the former number is born. And the like is true of every number in the ſecond column. During the courſe of the year, as many will die at all ages as were born at the beginning of the year; and conſequently, there will be an exceſs of the number alive at the beginning of the year above the number alive at the end of the year, equal to the whole number of the annual births; and the true number conſtantly alive together, is the arithmetical mean between theſe two numbers; or agreeably to the rule here given, the ſum of the numbers in the ſecond column of the table leſſened by half the number of annual births.

In ſuch a ſeries of numbers, the exceſs of each number above that which immediately follows it, will be the number dying every year out of the particular number alive at the beginning of the year; and theſe exceſſes ſet down regularly as in the third column of the table to which we have referred, will ſhow the different rates at which human life waſtes through all its different periods, and the different probabilities of life at all particular ages.

It muſt be remembered, that what has been now ſaid goes on the ſuppoſition, that the place whoſe bills of mortality are given, ſupports itſelf, by procreation only, in the number of its inhabitants. In towns this very ſeldom happens on account of the luxury and debauchery which generally prevail in them. They are, therefore, commonly kept up by a conſtant acceſſion of ſtrangers, who remove to them from country pariſhes and villages. In theſe circumſtances, in order to find the true number of inhabitants, and probabilities of life, from bills of mortality containing an account of the ages at which all die, it is neceſſary that the proportion of the annual births to the annual ſettlers ſhould be known, and alſo the period of life at which the latter remove. Both theſe particulars may be diſcovered in the following method.

If for a courſe of years there has been no ſenſible increaſe or decreaſe in a place, the number of annual ſettlers will be equal to the exceſs of the annual burials above the annual births. If there is an increaſe, it will be greater than this exceſs. If there is a decreaſe, it will be leſs.

The period of life at which theſe ſettlers remove, will appear in the bills by an increaſe in the number of deaths at that period and beyond it. Thus in the London bills the number of deaths between 20 and 30 is generally above double; and between 30 and 40 near triple the number of deaths between 10 and 20; and the true account of this is, that from the age of 18 or 20 to 35 or 50, there is an afflux of people every year to London from the country, which occaſions a great increaſe in the number of inhabitants at theſe ages; and conſequently raiſes the deaths for all ages above 20 conſiderably above their due proportion, when compared with the number of deaths before 20. This is obſervable in all the bills of mortality for towns with which we are acquainted, not excepting even the Breſlaw bills. Dr Halley takes notice, that theſe bills give the number of deaths between 10 and 20 too ſmall. This he conſidered as an irregularity in them owing to chance; and, therefore, in forming his table of obſervations, he took the liberty ſo far to correct it, as to render the proportion of thoſe who die to the living in this diviſion of life nearly the ſame with the proportion which, he ſays, he had been informed die annually of the young lads in Chriſt-Church Hoſpital. But the truth is, that this irregularity in the bills was derived from the cauſe we have juſt aſſigned. During the five years for which the Breſlaw bills are given by Dr Halley, the births did indeed a little exceed the burials; but it appears that this was the effect of ſome peculiar cauſes that happened to operate juſt at that time; for during a complete century from 1633 to 1734, the annual medium of births was 1089, and of burials 1256. This town, therefore, muſt have been all along kept up by a number of yearly recruits from other places, equal to about a ſeventh part of the yearly births.

It appears from the account in the Philoſophical Tranſactions (Abridgment, vol. vii. n° 380, p. 46, &c.), that from 1717 to 1725, the annual medium of births at Breſlaw was 1252, of burials 1507; and alſo that much the greateſt part of the births died under 10 years of age. From a table in Suſmilch's works, vol. i. p. 38. it appears, that in reality the greater part of all that die in this town are children under five years of age.

What has been now obſerved concerning the period of life at which people remove from the country to ſettle in towns, would appear ſufficiently probable were there no ſuch evidence for it as has been mentioned; for it might be well reckoned that theſe people in general muſt be ſingle perſons in the beginning of mature life, who, not having yet obtained ſettlements in the places where they were born, migrate to towns in queſt of employments.

Having premiſed theſe obſervations, it will be proper next to endeavour to explain diſtinctly the effect which theſe acceſſions to towns muſt have on tables of obſervation formed from their bills of mortality. This is a ſubject proper to be inſiſted on, becauſe miſtakes have been committed about it; and becauſe alſo the diſcuſſion of it is neceſſary to ſhow how near to truth the values of lives come as deduced from ſuch tables.

The following general rule may be given on this ſubject. If a place has for a courſe of years been maintained in a ſtate nearly ſtationary, as to number of inhabitants, by recruits coming in every year, to prevent the decreaſe that would ariſe from the exceſs of burials above the births, a table formed on the principle, "that the number dying annually after every particular age, is equal to the number living at that age," will give the number of inhabitants, and the probabilities of life, too great, for all ages preceding that at which the recruits ceaſe; and after this it will give them right. If the acceſſions are ſo great as to cauſe an increaſe in the place, ſuch a table will give the number of inhabitants and the probabilities of life too little after the age at which the acceſſions ceaſe; and too great if there is a decreaſe. Before that age it will in both caſes give them too great; but moſt conſiderably ſo in the former caſe, or when there is an increaſe.

Agreeably to theſe obſervations, if a place increaſes not in conſequence of acceſſions from other places, but of a conſtant exceſs of the births above the deaths, a table conſtructed on the principle that has been mentioned will give the probabilities of life too low through the whole extent of life; becauſe in ſuch circumſtances the number of deaths in the firſt ſtages of life muſt be too great, in compariſon of the number of deaths in the latter ſtages; and more or leſs ſo as the increaſe is more or leſs rapid. The contrary in all reſpects takes place where there is a decreaſe ariſing from the exceſs of the deaths above the births.

For example: Let us ſuppoſe that 244 of thoſe born in a town attain annually to 20 years of age, and that 250 more, all likewiſe 20 years of age, come into it annually from other places, in conſequence of which it has for a courſe of years been juſt maintained in the number of its inhabitants, without any ſenſible increaſe or decreaſe: in theſe circumſtances, the number of the living in the town of the age of 20 will be always 244 natives and 250 ſettlers, or 494 in all; and ſince theſe are ſuppoſed all to die in the town, and no more recruits are ſuppoſed to come in, 494 will be likewiſe the number dying annually at 20 and upwards. In the ſame manner it will appear, on theſe ſuppoſitions, that the number of the living, at every age ſubſequent to 20, will be equal to the number dying annually at that age and above it; and conſequently that the number of inhabitants and the decrements of life, for every ſuch age will be given exactly by the table. But for all ages before 20, they will be given much too great. For let 280 of all born in the town reach 10; in this caſe, 280 will be the true number of the living in the town at the age of 10; and the recruits not coming in till 20, the number given by the bills as dying between 10 and 20 will be the true number dying annually of the living in this diviſion of life. Let this number be 36; and it will follow that the table ought to make the numbers of the living at the ages between 10 and 20, a ſeries of decreaſing means between 280 and (280 diminiſhed by 36, or) 244. But in forming the table on the principle juſt mentioned, 250 (the number above 20 dying annually in the town who were not born in it) will be added to each number in this ſeries; and therefore the table will give the numbers of the living and the probabilities of life in this diviſion of life, almoſt twice as great as they really are. This obſervation, it is manifeſt, may be applied to all the ages under 20.

It is neceſſary to add, that ſuch a table will give the number of inhabitants and the probabilities of life equally wrong before 20, whether the recruits all come in at 20, agreeably to the ſuppoſition juſt made, or only begin then to come in. In this laſt caſe, the table will give the number of inhabitants and probabilities of life too great throughout the whole extent of life, if the recruits come in at all ages above 20. But if they ceaſe at any particular age, it will give them right only from that age; and before, it will err all along on the ſide of exceſs; but leſs conſideraby between 20 and that age than before 20. For example: if, of the 250 ſuppoſed to come in at 20, only 150 then come in, and the reſt at 30; the number of the living will be given 100 too high at every age between 20 and 30; but, as juſt ſhown, they will be given 250 too high at every age age before 20. In general, therefore, the number of the living at any particular age muſt be given by the ſuppoſed table as many too great as there are annual ſettlers after that ago; and if theſe ſettlers come in at all ages indiſcriminately, during any certain interval of life, the number of inhabitants and the probabilities of life will be continually growing leſs and leſs wrong the nearer any age is to the end of that interval. Theſe obſervations prove, that tables of obſervation formed in the common way, from bills of mortality for places where there is an exceſs of the burials above the births, muſt be erroneous for a great part of the duration of life, in proportion to the degree of that exceſs. They ſhow likewiſe at what parts of life the errors in ſuch tables are moſt conſiderable, and how they may be in a great meaſure corrected.

All this ſhall be exemplified in the particular caſe of London.

The number of deaths between the ages of 10 and 20 is always ſo ſmall in the London bills, that it ſeems certain few recruits come to London under 20, or at leaſt not ſo many as before this age are ſent out for education to ſchools and univerſities. After 20 great numbers come in till 30, and ſome perhaps till 40 or 50: but at every age after 50, it is probable that more retire from London than come to it. The London tables of obſervation therefore, being formed on the principle already mentioned, cannot give the probabilities of life right till 40. Between 30 and 40 they muſt be a little too high; but more ſo between 20 and 30, and moſt of all ſo before 20. It follows alſo, that theſe tables muſt give the number of inhabitants in London much too great.

The firſt of the following tables is formed in the manner here explained, from the London bills for 10 years, from 1759 to 1768, and adapted to 1000 born as a radix. The ſum of the numbers in the ſecond column, diminiſhed by half the number born, is 25,757. According to this table then, for every 1000 deaths in London there are 25¾ as many inhabitants; or, in other words, the expectation of a child just born is 25¾; and inhabitants are to the annual burials as 25¾ to 1. But it has appeared, that the numbers in the ſecond column, being given on the ſuppoſition that all thoſe who die in London were born there, muſt be too great; and we have from hence a demonſtration, that the probabilities of life are given in the common tables of London obſervations too high for at leaſt the firſt 30 years of life; and alſo, that the number of inhabitants in London muſt be leſs than 25¾ multiplied by the annual burials. The common tables therefore, of London obſervations. undoubtedly need correction, as Mr Simpſon ſuggeſted, and in ſome meaſure performed; though too imperfectly, and without going upon any fixed principles, or ſhowing particularly how tables of obſervation ought to be formed, and how far in different circumſtances, and at different ages, they are to be depended on. The way of doing this, and in general the right method of forming genuine tables of obſervation for towns, may be learned from the following rule:

"From the ſum of all that die annually, after any given age, ſubtract the number of annual ſettlers after that age; and the remainder will be the number of the living at the given time."

This rule can want no explication or proof after what has been already ſaid,

If, therefore, the number of annual ſettlers in a town at every age could be aſcertained, a perfect table of obſervations might be formed for that town from bills of mortality, containing an account of the ages at which all die in it. But no more can be learned in this inſtance, from any bills, than the whole number of annual ſettlers, and the general diviſion of life in which they enter. This, however, may be ſufficient to enable us to form tables that ſhall be tolerably exact. For inſtance: Suppoſe the annual deaths in a town which has not increaſed or decreaſed, to have been for many years in the proportion of 4 to 3 to the annual births. It will hence follow, that ¼ of the perſons who die in ſuch a town are ſetlers, or emigrants from other places, and not natives; and the ſudden increaſe in the deaths after 20 will alſo ſhow, agreeably to what was before obſerved, that they enter after this age. In forming, therefore, a table for ſuch a town, a quarter of all that dies at all ages throughout the whole extent of life muſt be deducted from the ſum of all that die after every given age before 20; and the remainder will be the true number living at that given age. And if at 20, and every age above it, this deduction is omitted, or the number of the living at every ſuch age is taken the ſame with the ſum of all that die after it, the reſult will be (ſuppoſing moſt of the ſettlers to come in before 30, and all before 40) a table exact till 20; too high between 20 and 30; but nearly right for ſome years before 40; and after 40 exact again. Such a table, Mortality. table, it is evident, will be the ſame with the table laſt deſcribed at all ages above 20, and different from it only under 20. It is evident alſo, that on account of its giving the probabilities of life too great for ſome years after 20, the number of inhabitants deduced from it may be depended on as ſomewhat greater than the truth; and more or leſs ſo, as the annual recruits enter in general later or ſooner after 20.

Let us now conſider what the reſult of theſe remarks will be, when applied particularly to the London bills.

It muſt be here firſt obſerved, that at leaſt one quarter of all that die in London are ſupplies or ſettlers from the country, and not natives. The medium of annual burials for 10 years, from 1759 to 1768, was 22,956; of births 15710. The exceſs is 7246, or near a third of the burials. The ſame exceſs during 10 years before 1750 was 10,500, or near half the burials. London was then decreaſing. For the laſt 12 or 15 years it has been increaſing. This exceſs, therefore, agreeably to the foregoing obſervations, was then greater than the number of annual ſettlers, and it is now leſs. It is however here ſuppoſed, that the number of annual ſettlers is now no more than a quarter of the annual burials, in order to allow for more emiſſions in the births than the burials; and alſo, in order to be more ſure of obtaining reſults that ſhall not exceed the truth.

Of every 1000 then who die in London only 750 are natives, and 250 are recruits who come to it after 18 or 20 years of age; and, conſequently, in order to obtain from the bills a more correct table than the firſt of the following tables, 250 muſt be ſubtracted from every one of the numbers in the ſecond column till 20; and the numbers in the third column muſt be kept the ſame, the bills always giving theſe right. After 20, the table is to be continued unaltered; and the reſult will be, a table which will give the numbers of the living at all ages in London much nearer the truth, but ſtill ſomewhat too high. Such is the ſecond of the following tables. The ſum of all the numbers in the ſecond column of this table, diminiſhed by 500, is 20,750. For every 1000 deaths, therefore, in London, there are, according to this table, 20,750 living perſons in it; or for every ſingle death $20\frac{3}{4}$ inhabitants. It was before ſhown, that the number of inhabitants in London could not be ſo great as 25 times $\frac{3}{4}$ the deaths. It now appears, (ſince the numbers in the ſecond column of this table are too high) that the number of inhabitants in London cannot be ſo great as even 20 times $\frac{3}{4}$ the deaths. And this is a concluſion which every one who will beſtow due attention on what has been ſaid, will find himſelf forced to receive. It will not be amiſs, however, to confirm it by the following fact, the knowledge of which is derived from the particular enquiry and information of Mr Harris, the late ingenious maſter of the royal mathematical ſchool in Chriſt-Church hoſpital. The average of lads in this ſchool has, for 30 years paſt, been 831. They are admitted at all ages between 7 and 11; and few ſtay beyond 16: they are therefore in general, lads between the ages of 8 and 16. They have better accommodations than it can be ſuppoſed children commonly have; and about 300 of them have the particular advantage of being educated in the country. In ſuch circumſtances, it may be well reckoned, that the proportion of children dying annually muſt be leſs than the general proportion of children dying annually at the ſame ages in London. The fact is, that for the laſt 30 years $11\frac{4}{5}$ have died annually, or one in $70\frac{2}{5}$.

According to Table II. one in 73 dies between 10 and 20, and one in 70 between 8 and 16. That table, therefore, probably gives the decrements of life in London, at theſe ages, too little, and the numbers of the living too great: and if this is true of theſe ages, it muſt be true of all other ages under 20; and it follows demonſtrably, in conformity to what was before ſhown, that more people ſettle in London after 20 than the fourth above ſuppoſed; and that from 20 to at leaſt 30 or 35, the numbers of the living are given too great, in proportion to the decrements of life.

In this table the numbers in the ſecond column are doubled at 20, agreeably to what really happens in London; and the ſum of the numbers in this column diminiſhed by half the whole number of deaths, gives the expectation of life, not of a child juſt born, as in other tables, but of all the inhabitants of London at the time they enter it, whether that be at birth or at 20 years of age. The *expectations*, therefore, and the *values* of London lives under 20, cannot be calculated from this table. But it may be very eaſily fitted for this purpoſe, by finding the number of births which, according to the given decrements of life, will leave 494 alive at 20; and then adapting the intermediate numbers in ſuch a manner to this radix, as to preſerve all along the number of the living in the ſame proportion to the numbers of the dead. This is done in the third of the following tables; and this table may be recommended as better adapted to the preſent ſtate of London than any other table. The values of lives, however, deduced from it, are in general nearly the ſame with thoſe deduced by Mr Simpſon from the London bills as they ſtood forty years ago; the main difference is, that after 52, and in old age, this table gives them ſomewhat lower than Mr Simpſon's table. The fourth and fifth of the following tables, compared with the two laſt, will give a diſtinct and full view of the difference between the rate of human mortality in great towns and in country pariſhes and villages.

TABLE I.

Showing the Probabilities of life in London, on the ſuppoſition that all who die in London were born there. Formed from the bills for 10 years, from 1759 to 1768.

Ages.	Perſons living.	Decr. of Life.	Ages.	Perſons living.	Decr. of Life.	Ages.	Perſons living.	Decr. Life.
0	1000	240	31	404	9	62	132	7
1	760	99	32	395	9	63	125	7
2	661	42	33	386	9	64	118	7
3	619	29	34	377	9	65	111	7
4	590	21	35	368	9	66	104	7
5	569	11	36	359	9	67	97	7
6	558	10	37	350	9	68	90	7
7	548	7	38	341	9	69	83	7
8	541	6	39	332	10	70	76	6
9	535	5	40	322	10	71	70	6
10	530	4	41	312	10	72	64	6
11	526	4	42	302	10	73	58	5
12	522	4	43	292	10	74	53	5
13	518	3	44	282	10	75	48	5
14	515	3	45	272	10	76	43	5
15	512	3	46	262	10	77	38	5
16	509	3	47	252	10	78	33	4
17	506	3	48	242	9	79	29	4
18	503	4	49	233	9	80	25	3
19	499	5	50	224	9	81	22	3
20	494	7	51	215	9	82	19	3
21	487	8	52	206	8	83	16	3
22	479	8	53	198	8	84	13	2
23	471	8	54	190	7	85	11	2
24	463	8	55	183	7	86	9	2
25	455	8	56	176	7	87	7	2
26	447	8	57	169	7	88	5	1
27	439	8	58	162	7	89	4	1
28	431	9	59	155	8	90	3	1
29	422	9	60	147	8			
30	413	9	61	139	7			

TABLE II.

Showing the true probabilities of life in London till the age of 19.

Ages.	Perſons living.	Decr. of Life.	Ages.	Perſons living.	Decr. of Life.
0	750	240	12	272	4
1	510	99	13	268	3
2	411	42	14	265	3
3	369	29	15	262	3
4	340	21	16	259	3
5	319	11	17	256	3
6	308	10	18	253	4
7	298	7	19	249	
8	291	6	20	494	
9	285	5	21	487	
10	280	4	&c.	&c.	
11	276	4			

The numbers in the ſecond column to be continued as in the laſt table.

TABLE III.

Showing the true probabilities of life in London for all ages. Formed from the bills for 10 years, from 1759 to 1768.

Ages.	Perſons living.	Decr. of Life.	Ages.	Perſons living.	Decr. of Life.	Ages.	Perſons living.	Decr. Life.
0	1518	486	31	404	9	62	132	7
1	1032	200	32	395	9	63	125	7
2	832	85	33	386	9	64	118	7
3	747	59	34	377	9	65	111	7
4	688	42	35	368	9	66	104	7
5	646	23	36	359	9	67	97	7
6	623	20	37	350	9	68	90	7
7	603	14	38	341	9	69	83	7
8	589	12	39	332	10	70	76	6
9	577	10	40	322	10	71	70	6
10	567	9	41	312	10	72	64	6
11	558	9	42	302	10	73	58	5
12	549	8	43	292	10	74	53	5
13	541	7	44	282	10	75	48	5
14	534	6	45	272	10	76	43	5
15	528	6	46	262	10	77	38	5
16	522	7	47	252	10	78	33	4
17	515	7	48	242	9	79	29	4
18	508	7	49	233	9	80	25	3
19	501	7	50	224	9	81	22	3
20	494	7	51	215	9	82	19	3
21	487	8	52	206	8	83	16	3
22	479	8	53	198	8	84	13	2
23	471	8	54	190	7	85	11	2
24	463	8	55	183	7	86	9	2
25	455	8	56	176	7	87	7	2
26	447	8	57	169	7	88	5	1
27	439	8	58	162	7	89	4	1
28	431	9	59	155	8	90	3	1
29	422	9	60	147	8			
30	413	9	61	139	7			

All the bills, from which the following tables are formed, give the numbers dying under 1 as well as under 2 years; and in the numbers dying under 1 are included, in the country pariſh in Brandenberg and at Berlin, all the ſtill borns. All the bills alſo give the numbers dying in every period of five years.

TABLE

TABLE IV.

Showing the Probabilities of Life in the Diſtrict of Vaud, Switzerland, formed from the Regiſters of 43 Pariſhes, given by Mr Muret, in the Firſt Part of the Bern Memoirs for the year 1766.

Age	Living	Decr	Age.	Living.	Decr.	Age.	Living.	Decr.
0	1000	189	31	558	5	62	286	12
1	811	46	32	553	5	63	274	12
2	765	30	33	548	4	64	262	12
3	735	20	34	544	5	65	250	14
4	715	14	35	539	6	66	236	16
5	701	13	36	533	6	67	220	18
6	688	11	37	527	7	68	202	18
7	677	10	38	520	7	69	184	16
8	667	8	39	513	7	70	168	15
9	659	6	40	506	6	71	153	13
10	653	5	41	500	6	72	140	11
11	648	5	42	494	6	73	129	10
12	643	4	43	488	6	74	119	10
13	639	4	44	482	6	75	109	11
14	635	4	45	476	7	76	98	13
15	631	5	46	469	8	77	85	14
16	626	4	47	461	10	78	71	13
17	622	4	48	451	10	79	58	12
18	618	4	49	441	10	80	46	10
19	614	4	50	431	9	81	36	7
20	610	4	51	422	8	82	29	5
21	606	4	52	414	8	83	24	4
22	602	5	53	406	9	84	20	3
23	597	5	54	397	9	85	17	3
24	592	5	55	388	11	86	14	3
25	587	5	56	377	13	87	11	2
26	582	5	57	364	16	88	9	2
27	577	5	58	348	17	89	7	2
28	572	5	59	331	17	90	5	1
29	567	4	60	314	15			
30	563	5	61	299	13			

TABLE V.

Showing the Probabilities of Life in a Country Pariſh in Brandenburg, formed from the Bills for 50 Years, from 1710 to 1759, as given by Mr Suſmilch in his Gottliche Ordnung.

Age	Living	Decr.	Age.	Living.	Decr.	Age.	Living.	Decr.
0	1000	225	31	482	5	62	260	12
1	775	57	32	477	5	63	248	12
2	718	31	33	472	5	64	236	12
3	687	23	34	467	5	65	224	11
4	664	22	35	462	6	66	213	11
5	642	20	36	456	6	67	202	12
6	622	15	37	450	6	68	190	12
7	607	12	38	444	6	69	178	12
8	595	10	39	438	6	70	166	13
9	585	8	40	432	5	71	153	15
10	577	7	41	427	5	72	138	16
11	570	6	42	422	5	73	122	15
12	564	5	43	417	5	74	107	14
13	559	5	44	412	6	75	93	13
14	554	5	45	407	6	76	80	12
15	549	5	46	400	6	77	68	9
16	544	5	47	394	6	78	59	8
17	539	4	48	388	7	79	51	7
18	535	4	49	381	7	80	44	6
19	531	4	50	374	7	81	38	6
20	527	5	51	367	8	82	32	6
21	522	5	52	359	8	83	25	6
22	517	5	53	351	8	84	21	5
23	512	5	54	343	9	85	15	4
24	507	5	55	334	10	86	11	3
25	502	4	56	324	10	87	8	2
26	498	3	57	314	10	88	6	2
27	495	3	58	304	11	89	4	1
28	492	3	59	293	11	90	3	1
29	489	3	60	282	11	91	2	1
30	486	4	61	271	11	92	1	1

TABLE VI.

Showing the Probabilities of Life at Vienna, formed from the Bills for Eight years, as given by Mr Suſmilch, in his Gottliche Ordnung, page 32, Tables.

Age.	Living	Decr	Age.	Living	Decr.	Age.	Living.	Decr.
0	1495	682	31	364	6	62	129	6
1	813	107	32	358	5	63	123	7
2	706	61	33	353	6	64	116	7
3	645	46	34	347	7	65	109	8
4	599	33	35	340	8	66	101	8
5	566	30	36	332	8	67	93	8
6	536	20	37	324	8	68	85	7
7	516	11	38	316	9	69	78	7
8	505	9	39	307	9	70	71	6
9	496	7	40	298	8	71	65	5
10	489	6	41	290	7	72	60	5
11	483	5	42	283	6	73	55	4
12	478	5	43	277	6	74	51	4
13	473	6	44	271	7	75	47	5
14	467	6	45	264	8	76	42	5
15	461	6	46	256	9	77	37	5
16	455	7	47	247	9	78	32	5
17	448	6	48	238	9	79	27	4
18	442	6	49	229	9	80	23	3
19	436	6	50	220	8	81	20	2
20	430	5	51	212	7	82	19	2
21	425	5	52	205	7	83	16	2
22	420	5	53	198	7	84	14	2
23	415	6	54	191	7	85	12	2
24	409	6	55	184	8	86	10	2
25	403	6	56	176	8	87	8	2
26	397	6	57	168	9	88	6	2
27	391	7	58	159	8	89	4	1
28	384	7	59	151	8	90	3	1
29	377	7	60	143	7	91	2	1
30	370	6	61	136	7	92	1	1

TABLE VII.

Showing the Probabilities of Life at Berlin, formed from the Bills for Four Years, from 1752 to 1755, given by Mr Suſmilch in his Gottliche Ordnung, vol. ii. page 37, Tables.

Age.	Living.	Decr.	Age.	Living.	Decr.	Age.	Living.	Decr.
0	1427	524	33	361	7	65	112	6
1	903	151	34	354	7	66	106	7
2	752	61	35	347	8	67	99	7
3	691	73	36	339	9	68	92	6
4	618	45	37	330	10	69	86	6
5	573	21	38	320	10	70	80	6
6	552	15	39	310	10	71	74	6
7	536	13	40	300	10	72	68	6
8	523	9	41	290	9	73	62	5
9	514	7	42	281	8	74	57	5
10	507	5	43	274	7	75	52	5
11	502	4	44	266	7	76	47	5
12	498	4	45	259	7	77	42	5
13	494	4	46	252	7	78	37	5
14	490	4	47	245	7	79	32	4
15	486	4	48	238	7	80	28	4
16	482	5	49	231	7	81	24	3
17	477	5	50	224	7	82	21	2
18	472	5	51	217	7	83	19	2
19	467	6	52	210	7	84	17	2
20	461	6	53	203	8	85	15	2
21	455	6	54	195	8	86	13	2
22	449	6	55	187	8	87	11	2
23	443	7	56	179	8	88	9	2
24	436	8	57	171	8	89	7	1
25	428	9	58	163	9	90	6	1
26	421	9	59	154	9	91	5	1
27	412	9	60	145	8	92	4	1
28	403	9	61	137	7	93	3	1
29	394	9	62	130	6	94	2	1
30	385	9	63	124	6			
31	376	8	64	118	6			
32	368	7						

Brief *of* MORTANCESTRY, in Scots law; anciently the ground of an action at the inſtance of an heir, in the ſpecial caſe where he had been excluded from the poſſeſſion of his anceſtor's eſtate by the ſuperior, or other perſon pretending right.

MORTAR, a preparation of lime and ſand mixed with water, which ſerves as a cement, and is uſed by maſons and bricklayers in building walls of ſtone and brick.

Under the article Cement, we have already given the theory of mortar, as delivered by Mr Anderſon; which has now received a further confirmation by a recent diſcovery, that if the lime is ſlaked, and the mortar made up, with lime-water inſtead of common water, the mortar will be much better. The reaſon of this is, that in common water, eſpecially ſuch as is drawn from wells, there is always a conſiderable quantity of fixed air, which, mingling with the mortar previous to its being uſed, ſpoils it by reducing the quicklime in part to an inert calcareous earth like chalk; but when it is built up in a perfectly cauſtic ſtate, it attracts the air ſo ſlowly, that it hardens into a kind of ſtony matter as hard as was the rock from whence the limeſtone was taken.

Mortar, a chemical utenſil very uſeful for the diviſion of bodies, partly by percuſſion and partly by grinding. Mortars have the form of an inverted bell. The matter intended to be pounded is to be put into them, and there it is to be ſtruck and bruiſed by a long inſtrument called a *peſtle*. The motion given to the peſtle ought to vary according to the nature of the ſubſtances to be pounded. Thoſe which are eaſily broken, or which are apt to fly out of the mortar, or which are hardened by the ſtroke of the peſtle, require that this inſtrument ſhould be moved circularly, rather by grinding and bruiſing than by ſtriking. Thoſe ſubſtances which are ſoftened by the heat occaſioned by rubbing and percuſſion, require to be pounded very ſlowly. Laſtly, thoſe which are very hard, and which are not capable of being ſoftened, are eaſily pounded by repeated ſtrokes of the peſtle. They require no bruiſing but when they are brought to a certain degree of fineneſs. But theſe things are better learned by habit and practice than by any directions.

As mortars are inſtruments which are conſtantly uſed in chemiſtry, they ought to be kept of all ſizes and materials; as of marble, copper, glaſs, iron, gritſtone, and agate. The nature of the ſubſtance to be pounded determines the choice of the kind of mortar. The hardneſs and diſſolving power of that ſubſtance are particularly to be attended to. As copper is a ſoft metal, ſoluble by almoſt all menſtruums, and hurtful to health, good artiſts have ſome time ago proſcribed the uſe of this metal.

One of the principal inconveniences of pulveriſation in a mortar proceeds from the fine powder which riſes abundantly from ſome ſubſtances during the operation. If theſe ſubſtances be precious, the loſs will be conſiderable; and if they be injurious to health, they may hurt the operator. Theſe inconveniences may be remedied, either by covering the mortar with a ſkin, in the middle of which is a hole, through which the peſtle paſſes; or by moiſtening the matter with a little water when this addition does not injure it; or, laſtly, by covering the mouth and noſe of the operator with a fine cloth, to exclude this powder. Some ſubſtances, as corroſive ſublimate, arſenic, calxes of lead, cantharides, euphorbium, &c. are ſo noxious, that all theſe precautions ought to be uſed, particularly when a large quantity of them is pounded.

Large mortars ought to be fixed upon a block of wood, ſo high, that the mortar ſhall be level with the middle of the operator. When the peſtle is large and heavy, it ought to be ſuſpended by a cord or chain fixed to a moveable pole, placed horizontally above the mortar: this pole conſiderably relieves the operator, becauſe its elaſticity aſſiſts the raiſing of the peſtle.

MORTAR-PIECE, in the military art, a ſhort piece of ordnance, thick and wide, proper for throwing bombs, carcaſes, ſhells, ſtones, bags filled with grape-ſhot, &c. See GUNNERY, n° 50.

Land MORTARS, are thoſe uſed in ſieges, and of late in battles, mounted on beds made of ſolid timber, conſiſting generally of four pieces, thoſe of the royal and cohorn excepted, which are but one ſingle block; and both mortar and bed are tranſported on block-carriages. There is likewiſe a kind of land-mortars, mounted on travelling carriages, invented by count Buckeburg, which may be elevated to any degree; whereas ours are fixed to an angle of 45 degrees, and firmly laſhed with ropes. The following table ſhows the weight of land-mortars and ſhells; together with the quantity of powder the chambers hold when full; the weight of the ſhells, and powder for loading them.

Diameter of mortars.	13-inch.			10-inch.			8-inch.			5-8-inch royal.			4.6-inch cohorn.		
	C.	qr.	lb.	C.	qr.	lb	C.	qr.	lb	C.	qr.	lb	C.	qr.	lb.
Mortar's weight.	25	0	0	10	2	18	4	0	20	1	1	0	0	3	0
Shell's weight.	1	2	15	0	2	25	0	1	15	0	0	12	0	0	7
	lb.	oz.	gr	lb.	oz.	gr.	lb.	oz.	gr.	lb.	oz.	gr.	lb.	oz.	gr
Shell's cont. of powder.	9	4	8	4	14	12	2	3	8	1	1	8	0	8	0
Chamber's cont. of powder.	9	1	8	4	0	0	2	0	10	1	0	0	0	8	0

Sea MORTARS, are thoſe which are fixed in the bomb-veſſels for bombarding places by ſea: and as they are generally fired at a much greater diſtance than that which is required by land, they are made ſomewhat longer and much heavier than the land-mortars. The following table exhibits the weight of the ſea-mortars and ſhells, and alſo of their full charges.

Nature of the mortar.	Powder contained in the chamber when full		Weight of the mortar			Weight of the ſhell when fixed.	Weight of powder contained in the ſhell.	
	lb.	oz.	C.	qr.	lb.	lb.	lb.	oz.
10-inch howitzer.	12	0	31	2	26			
13-inch mortar.	30	0	81	2	1	198	7	0
10-inch mortar.	12	0	34	2	11	93		

To Charge or Load a Mortar, the proper quantity of gunpowder is put into the chamber, and if there be any vacant ſpace they fill it up with hay; ſome chooſe a wooden plug; over this they lay a turf, ſome a wooden tampion fitted to the bore of the piece; and laſtly the bomb; taking care that the fuſe be in the axis thereof, and the orifice be turned from the muzzle of the piece: what ſpace remains is to be filled up with hay, ſtraw, turf, &c. ſo as the load may not be exploded without the utmoſt violence.

The quantity of gunpowder to be uſed is found by dividing the weight of the bomb by 30; though this rule is not always to be ſtrictly obſerved.

When the proper quantity of powder neceſſary to charge a ſea-mortar is put into the chamber, it is covered with a wad, well beat down with a rammer. After this the fixed ſhell is placed upon the wad, as near the middle of the mortar as poſſible, with the fuſe-hole uppermoſt, and another wad preſſed down cloſe upon it, ſo as to keep the ſhell firm in its poſition. The officer then points the mortar according to the propoſed inclination.—When the mortar is thus fixed, the fuſe is opened; the priming-iron is alſo thruſt into the touch-hole of the mortar to clear it, after which it is primed with the fineſt powder. This done, two of the matroſſes or ſailors, taking each one of the matches, the firſt lights the fuſe, and the other fires the mortar. The bomb, thrown out by the exploſion of the powder, is carried to the place intended: and the fuſe, which ought to be exhauſted at the inſtant of the ſhell's falling, inflames the powder contained in it, and burſts the ſhell in ſplinters; which, flying off circularly, occaſion incredible miſchief whereſoever they reach.

If the ſervice of mortars ſhould render it neceſſary to uſe pound-ſhots, 200 of them with a wooden bottom are to be put into the 13 inch mortar, and a quantity of powder not exceeding 5 pounds; and 100 of the above ſhot with 2½ pounds of powder, for the 10 inch mortar, or three pounds at moſt.

To Elevate the Mortar ſo as its axis may make any given angle with the horizon, they apply the artillery-level or gunner's quadrant. An elevation of 70 or 80 degrees is what is commonly choſen for rendering mortars moſt ſerviceable in caſting ſhells into towns, forts, &c. though the greateſt range be at 45 degrees.

All the Engliſh mortars are fixed to an angle of 45 degrees, and laſhed ſtrongly with ropes at that elevation. Although in a ſiege there is only one caſe in which ſhells ſhould be thrown with an angle of 45 degrees; that is, when the battery is ſo far off that they cannot otherwiſe reach the works: for when ſhells are thrown out of the trenches into the works of a fortification, or from the town into the trenches, they ſhould have as little elevation as poſſible, in order to roll along, and not bury themſelves; whereby the damage they do, and the terror they occaſion, are much greater than if they ſink into the ground. On the contrary, when ſhells are thrown upon magazines or any other buildings with an intention to deſtroy them, the mortars ſhould be elevated as high as poſſible, that the ſhells may acquire a greater force in their fall, and conſequently do greater execution.

If all mortar pieces were, as they ought to be, exactly ſimilar, and their requiſites of powder as the cubes of the diameters of their ſeveral bores, and if their ſhells, bombs, carcaſes, &c. were alſo ſimilar; then, comparing like with like, their ranges on the plane of the horizon, under the ſame degree of elevation, would be equal; and conſequently one piece being well proved, *i. e.* the range of the grenado, bomb, carcaſe, &c. being found to any degree of elevation, the whole work of the mortar-piece would become very eaſy and exact.

But ſince mortars are not thus ſimilar, it is required, that the range of the piece, at ſome known degree of elevation, be accurately found by meaſuring; and from hence all the other ranges may be determined.

Thus, to find the range of the piece at any other elevation required; ſay, As the ſign of double the angle under which the experiment was made, is to the ſine of double the angle propoſed, ſo is the range known to the range required.

Suppoſe, for inſtance, it be found, that the range of a piece, elevated to 30°, is 2000 yards: to find the range of the ſame piece with the ſame charge when elevated to 45°; take the ſine of 60°, the double of 30°, and make it the firſt term of the rule of three; the ſecond term muſt be the ſine of 90°, the double of 45°, and the third the given range 2000; the fourth term will be 2310, the range of the piece at 45°. If the elevation be greater than 45°, inſtead of doubling it, take the ſine of double its complement to 90°. As ſuppoſe the elevation of a piece to be 50°, take the ſine of 80°, the double of 40°. Again, if a determinate diſtance to which a ſhot is to be caſt, be given, and the angle of elevation to produce that effect be required; the range known muſt be the firſt term in the rule of three, which ſuppoſe 2000 yards; the range propoſed, which we ſuppoſe 1600 yards, the ſecond term; and the ſine of 60 double of the elevation for the range of 2000 yards, the third term. The fourth term will be found the ſine of 43° 52′, whoſe half 21° 56′ is the angle of elevation the piece muſt have to produce the deſired effect. and if 21° 56′ be taken from 90°, you will have 68° 4′ for the other elevation of the piece, with which the ſame effect will likewiſe be produced.

Note, to avoid the trouble of finding ſines of double the angles of propoſed elevations, Galileo and Torricelli give us the following table, wherein the ſigns of the angles ſought are had by inſpection.

Mortar, Mortgage.

Degrees.	Degrees.	Ranges.	Degrees.	Degrees.	Ranges.
90	0	0	0	0	0
89	1	349	66	24	7431
88	2	698	65	25	7660
87	3	1045	64	26	7880
86	4	1392	63	27	8090
85	5	1736	62	28	8290
84	6	2709	61	29	8480
83	7	2419	60	30	8660
82	8	2556	59	31	8829
81	9	3090	58	32	8988
80	10	3420	57	33	9135
79	11	3746	56	34	9272
78	12	4067	55	35	9397
77	13	4384	54	36	9511
76	14	4695	53	37	9613
75	15	5000	52	38	9703
74	16	5299	51	39	9781
73	16	5592	50	40	9841
72	18	5870	49	41	9903
71	19	6157	48	42	9945
70	20	6428	47	43	9976
69	21	6691	46	44	9994
68	22	6947	45	45	10000
67	23	7193			

The uſe of the table is obvious. Suppoſe, for inſtance, it be known by experiment, that a mortar elevated 15°, charged with three pounds of powder, will throw a bomb to the diſtance of 350 fathoms; and it be required, with the ſame charge, to throw a bomb 100 fathoms farther; ſeek in the table the number anſwering to 15 degrees, and you will find it 5000. Then as 350 is to 450, ſo is 5000 to a fourth number, which is 6428. Find this number, or the neareſt to it, in the table, and againſt it you will find 20° or 70°; the proper angles of elevation.

MORTGAGE, in law (*mortuum vadium*, or dead-pledge), is where a man borrows of another a ſpecific ſum (*e. g.* 200 l.), and grants him an eſtate in fee, on condition that if he, the mortgager, ſhall pay the mortgagee the ſaid ſum of 200 l. on a certain day mentioned in the deed, that then the mortgager may re-enter on the eſtate ſo granted in pledge; or, as is now the more uſual way, that the mortgagee ſhall reconvey the eſtate to the mortgager: in this caſe the land which is ſo put in pledge, is by law, in caſe of nonpayment at the time limited, for ever dead and gone from the mortgager; and the mortgagee's eſtate in the lands is then no longer conditional, but abſolute. But ſo long as it continues conditional, that is, between the time of lending the money and the time allotted for payment, the mortgage is called *tenant in mortgage*. But as it was formerly a doubt, whether, by taking ſuch eſtate in fee, it did not become liable to the wife's dower, and other incumbrances of the mortgage (though that doubt has been long ago over-ruled by courts of equity), it therefore became uſual to grant only a long term of years, by way of mortgage; with condition to be void on repayment of the mortgage-money: which courſe has been ſince continued, principally becauſe on the death of the mortgagee ſuch term becomes veſted in his perſonal repreſentatives, who alone are entitled in equity to receive the money lent, or whatever nature the mortgage may happen to [illegible]

As ſoon as the eſtate is cr[illegible] immediately enter on the land[illegible] poſſeſſed, upon performance [illegible] ment of the mortgage-money at the [illegible] therefore the uſual way is to agree that th[illegible] ſhall hold the land till the day aſſigned for payment; when, in caſe of failure, whereby the eſtate becomes abſolute, the mortgagee may enter upon it and take poſſeſſion, without any poſſibility at law of being afterwards evicted by the mortgagor, to whom the land is now forever dead. But here again the courts of equity interpoſe; and though a mortgage be thus forfeited, and the eſtate abſolutely veſted in the mortgagee at the common law, yet they will conſider the real value of the tenements compared with the ſum borrowed. And if the eſtate be of greater value than the ſum lent thereon, they will allow the mortgagor at any reaſonable time to re-call or redeem his eſtate; paying to the mortgagee his principal, intereſt, and expences: for otherwiſe, in ſtrictneſs of law, an eſtate worth 1000l. might be forfeited for non-payment of 100l. or a leſs ſum. This reaſonable advantage, allowed to mortgagors, is called the *equity of redemption*; and this enables a mortgagor to call on a mortgagee, who has poſſeſſion of his eſtate, to deliver it back, and account for the rents and profits received on payment of his whole debt and intereſt, thereby turning the *mortuum* into a kind of *vivum vadium*; (ſee Vadium). But, on the other hand, the mortgagee may either compel the ſale of the eſtate, in order to get the whole of his money immediately; or elſe call upon the mortgagor to redeem his eſtate preſently, or, in default thereof, to be for ever foreclosed from redeeming the ſame; that is, to loſe his equity of redemption without poſſibility of recall. And alſo, in ſome caſes of fraudulent mortgages, the fraudulent mortgagor forfeits all equity of redemption whatſoever. It is not, however, uſual for mortgagees to take poſſeſſion of the mortgaged eſtate, unleſs where the ſecurity is precarious, or ſmall; or where the mortgagor neglects even the payment of intereſt: when the mortgagee is frequently obliged to bring an ejectment, and take the land into his own hands, in the nature of a pledge, or the *pignus* of the Roman law: whereas, while it remains in the hands of the mortgagor, it more reſembles their hypotheca, which was where the poſſeſſion of the thing pledged remained with the debtor. But by ſtatute 7 Geo. II. c. 20. after payment or tender by the mortgagor of principal, intereſt, and coſts, the mortgagee can maintain no ejectment; but may be compelled to re-aſſign his ſecurities. In Glanvil's time, when the univerſal method of conveyance was by livery of ſeiſin or corporal tradition of the lands, no gage or pledge of lands was good unleſs poſſeſſion was alſo delivered to the creditor; *ſi non ſequatur ipſius vadii traditio, curia domini regis hujuſmodi privatas conventiones tueri non ſolet*: for which the reaſon given is, to prevent ſubſequent and fraudulent pledges of the ſame land; *cum in tali caſu poſſit eadem res pluribus aliis creditoribus tum prius tum poſterius invadiari*. And the frauds which have ariſen, ſince the exchange of theſe public and notorious conveyances for more private and ſecret bargains, have well evinced the wiſdom of the ancient law.

MORTIER, an enſign of dignity, formerly borne by the chancellor and grand preſidents of the parliament of France. That borne by the chancellor was a piece of cloth of gold, edged and turned up with ermine; and that of the firſt preſident was a piece of black velvet edged with a double row of gold-lace, while that of the other preſidents was only edged with a ſingle row. This they formerly carried on their heads in grand ceremonies, ſuch as the entry of the king: but ordinarily they carried them in the hand.

MORTIFICATION, in medicine and ſurgery, a total extinction of the natural heat of the body, or a part thereof. Some define mortification a diſeaſe, wherein the natural juices of any part quite loſe their proper motion; and by that means fall into a fermentative one, and corrupt and deſtroy the texture of the part. See Surgery.

Mortification, in religion, any ſevere penance obſerved on a religious account. How ancient and how univerſal the practice of it has been, and for what reaſons obſerved, ſee Fast.

MORTIMER (John), a late Engliſh artiſt, born in 1743. According to Mr Strutt, "he was endowed with every requiſite to make a great painter; his genius fertile, and his imagination lively. There is an originality in his works which adds greatly to their value. No man perhaps touched the heads and other extremities of his figures with more ſpirit; and few could draw them more correctly. When he failed, it was from his haſte to expreſs his thoughts; ſo that at times he did not attend with that preciſion which hiſtorical painting requires to the proportion of his figures; and they are ſometimes heavy. This defect is, however, well repaid by the lightneſs of his pencil, and the freedom which appears in his works." He died at his houſe in Norfolk-ſtreet in 1779, aged 36.—"King John granting the Magna Charta to the barons," and the "Battle of Agincourt," two of his capital pictures, have been engraved. The firſt was nearly finiſhed by Mr Ryland, and completed by Mr Bartolozzi. The laſt, intended as a companion to the former, was publiſhed by Mrs Mortimer.

MORTISE, or Mortoise, in carpentry, &c. a kind of joint wherein a hole of a certain depth is made in a piece of timber, which is to receive another piece called a *tenon*.

MORTMAIN, or Alienation *in Mortmain, (in mortua manu)*, is an alienation of lands or tenements to any corporation, ſole or aggregate, eccleſiaſtical or temporal *: but theſe purchaſes having been chiefly made by religious houſes, in conſequence whereof the lands became perpetually inherent in one dead hand, this hath occaſioned the general appellation of *mortmain* to be applied to ſuch alienations, and the religious houſes themſelves to be principally conſidered in forming the ſtatutes of mortmain: in deducing the hiſtory of which ſtatutes, it will be matter of curioſity to obſerve the great addreſs and ſubtle contrivance of the eccleſiaſtics in eluding from time to time the laws in being, and the zeal with which ſucceſſive parliaments have purſued them through all their fineſſes: how new remedies were ſtill the parents of new evaſions; till the legiſlature at laſt, though with difficulty, hath obtained a deciſive victory.

* See Corporation.

By the common law any man might diſpoſe of his lands to any other private man at his own diſcretion, eſpecially when the feodal reſtraints of alienation were worn away. Yet in conſequence of theſe it was always, and is ſtill neceſſary, for corporations to have a licence of mortmain from the crown, to enable them to purchaſe lands: for as the king is the ultimate lord of every fee, he ought not, unleſs by his own conſent, to loſe his privilege of eſcheats and other feodal profits, by the veſting of lands in tenants that can never be attainted or die. And ſuch licences of mortmain ſeem to have been neceſſary among the Saxons above 60 years before the Norman conqueſt. But, beſides this general licence from the king as lord paramount of the kingdom, it was alſo requiſite, whenever there was a meſne or intermediate lord between the king and the alienor, to obtain his licence alſo (upon the ſame feodal principles) for the alienation of the ſpecific land. And if no ſuch licence was obtained, the king or other lord might reſpectively enter on the lands ſo alienated in mortmain, as a forfeiture. The neceſſity of this licence from the crown was acknowledged by the conſtitutions of Clarendon, in reſpect of advowſons, which the monks always greatly coveted, as being the groundwork of ſubſequent appropriations. Yet ſuch were the influence and ingenuity of the clergy, that (notwithſtanding this fundamental principle) we find that the largeſt and moſt conſiderable donations of religious houſes happened within leſs than two centuries after the conqueſt. And (when a licence could not be obtained) their contrivance ſeems to have been this: That as the forfeiture for ſuch alienations accrued in the firſt place to the immediate lord of the fee, the tenant who meant to alienate firſt conveyed his lands to the religious houſe, and inſtantly took them back again to hold as tenant to the monaſtery; which kind of inſtantaneous ſeiſin was probably held not to occaſion any forfeiture: and then, by pretext of ſome other forfeiture, ſurrender, or eſcheat, the ſociety entered into thoſe lands in right of ſuch their newly acquired ſigniority, as immediate lords of the fee. But when theſe donations began to grow numerous, it was obſerved that the feodal ſervices, ordained for the defence of the kingdom, were every day viſibly withdrawn; that the circulation of landed property from man to man began to ſtagnate; and that the lords were curtailed of the fruits of their ſigniories, their eſcheats, wardſhips, reliefs, and the like: and therefore, in order to prevent this, it was ordained by the ſecond of King Henry III.'s great charters, and afterwards by that printed in the common ſtatute-books, that all ſuch attempts ſhould be void, and the land forfeited to the lord of the fee.

Blackſt. Comment.

But as this prohibition extended only to religious houſes, biſhops and other ſole corporations were not included therein; and the aggregate eccleſiaſtical bodies (who, Sir Edward Coke obſerves, in this were to be commended, that they ever had of their counſel the beſt learned men that they could get) found many means to creep out of this ſtatute, by buying in lands that were *bona fide* holden of themſelves as lords of the fee, and thereby evading the forfeiture; or by taking long leaſes for years, which firſt introduced thoſe extenſive terms, for a thouſand or more years, which are now ſo frequent in conveyances. This produced the ſtatute *de religioſis*, 7 Edward I.; which provided, that no perſon, religious or other whatſoever, ſhould buy, or ſell, or receive, under pretence of a gift, or term of years, or any other title whatſoever, nor ſhould by any art or ingenuity appropriate to himſelf, any lands or tenements in mortmain; upon pain that the immediate lord of the fee, or, on his default for one year, the lords paramount, and, in default of all of them, the king, might enter thereon as a forfeiture.

This ſeemed to be a ſufficient ſecurity againſt all alienations in mortmain: but as theſe ſtatutes extended only to gifts and conveyances between the parties, the religious houſes now began to ſet up a fictitious title to the land, which it was intended they ſhould have, and to bring an action to recover it againſt the tenant: who, by fraud and colluſion, made no defence, and thereby judgment was given for the religious houſe, which then recovered the land by a ſentence of law upon a ſuppoſed prior title. And thus they had the honour of inventing thoſe fictitious adjudications of right, which are ſince become the great aſſurance of the kingdom, under the name of *common* RECOVERIES. But upon this the ſtatute of Weſtminſter the ſecond, 13 Edw. I. c. 32. enacted, that in ſuch caſes a jury ſhall try the true right of the demandants or plaintiffs to the land; and if the religious houſe or corporation be found to have it, they ſhall ſtill recover ſeiſin; otherwiſe it ſhall be forfeited to the immediate lord of the fee, or elſe to the next lord, and finally to the king, upon the immediate or other lords default. And the like proviſion was made by the ſucceeding chapter, in caſe the tenants ſet up croſſes upon their lands (the badges of knights templars and hoſpitallers) in order to protect them from the feudal demands of their lords, by virtue of the privileges of thoſe religious and military orders. And ſo careful was this provident prince to prevent any future evaſions, that when the ſtatute of *quia emptores*, 18 Edward I. aboliſhed all ſub-infeudations, and gave liberty for all men to alienate their lands to be holden of their next immediate lord, a proviſo was inſerted that this ſhould not extend to authoriſe any kind of alienation in mortmain. And when afterwards the method of obtaining the king's licence by writ of *ad quod damnum* was marked out by the ſtatute 27 Edward I. ſt. 2. it was farther provided by ſtatute 34 Edward I. ſt. 3. that no ſuch licence ſhould be effectual without the conſent of the meſne or intermediate lords.

Yet ſtill it was found difficult to ſet bounds to eccleſiaſtical ingenuity: for when they were driven out of all their former holds, they deviſed a new method of conveyance, by which the lands were granted, not to themſelves directly, but to nominal feoffees to the uſe of the religious houſes; thus diſtinguiſhing between the poſſeſſion and the uſe, and receiving the actual profits, while the ſeiſin of the land remained in the nominal feoffee; who was held by the courts of equity (then under the direction of the clergy) to be bound in conſcience to account to his *ceſtuy que uſe* for the rents and emoluments of the eſtate. And it is to theſe inventions that our practiſers are indebted for the introduction of uſes and truſts, the foundation of modern conveyancing. But, unfortunately for the inventors themſelves, they did not long enjoy the advantage of their new device; for the ſtatute 15 Richard II. c. 5. enacts, that the lands which had been ſo purchaſed to uſes ſhould be amortiſed by licence from the crown, or elſe be ſold to private perſons; and that for the future uſes they ſhall be ſubject to the ſtatutes of mortmain, and forfeitable like the lands themſelves. And whereas the ſtatutes had been eluded by purchaſing large tracts of land adjoining to churches, and conſecrating them by the name of *church-yards*, ſuch ſubtile imagination is alſo declared to be within the compaſs of the ſtatutes of mortmain. And civil or lay corporations, as well as eccleſiaſtical, are alſo declared to be within the miſchief, and of courſe within the remedy provided by thoſe ſalutary laws. And laſtly, as during the times of popery lands were frequently given to ſuperſtitious uſes, though not to any corporate bodies; or were made liable in the hands of heirs and deviſees to the charge of obits, chauntries, and the like, which were equally pernicious in a well-governed ſtate as actual alienations in mortmain; therefore at the dawn of the Reformation, the ſtatute 23 Hen. VIII. c. 10. declares, that all future grants of lands for any of the purpoſes aforeſaid, if granted for any longer term than 20 years, ſhall be void.

But during all this time, it was in the power of the crown, by granting a licence of mortmain, to remit the forfeiture, ſo far as related to its own rights; and to enable any ſpiritual or other corporation to purchaſe and hold any lands or tenements in perpetuity: which prerogative is declared and confirmed by the ſtatute 18 Edw. III. ſt. 3. c. 3. But as doubts were conceived at the time of the Revolution how far ſuch licence was valid, ſince the king had no power to diſpenſe with the ſtatutes of mortmain by a clauſe of *non obſtante*, which was the uſual courſe, though it ſeems to have been unneceſſary; and as, by the gradual declenſion of meſne ſigniories through the long operation of the ſtatute of *quia emptores*, the rights of intermediate lords were reduced to a very ſmall compaſs; it was therefore provided by the ſtatute 7 & 8 W. III. c. 37. that the crown for the future at its own diſcretion may grant licences to alienate or take in mortmain, of whomſoever the tenements may be holden.

After the diſſolution of monaſteries under H. VIII. though the policy of the next popiſh ſucceſſor affected to grant a ſecurity to the poſſeſſors of abbey-lands, yet, in order to regain ſo much of them as either the zeal or timidity of their owners might induce them to part with, the ſtatutes of mortmain were ſuſpended for 20 years by the ſtatute 1 & 2 P. & M. c. 8. and during that time any lands or tenements were allowed to be granted to any ſpiritual corporation without any licence whatſoever. And long afterwards, for a much better purpoſe, the augmentation of poor livings, it was enacted by the ſtatute 17 Car. II. c. 3. that appropriators may annex the great tithes to the vicarages; and that all benefices under 100 l. *per annum* may be augmented by the purchaſe of lands, without licence of mortmain in either caſe; and the like proviſion hath been ſince made in favour of the governors of queen Anne's bounty. It hath alſo been held, that the ſta-

Morton, Mortuary.

tute 23 Hen. VIII. before mentioned, did not extend to any thing but ſuperſtitious uſes; and that therefore a man may give lands for the maintenance of a ſchool, an hoſpital, or any other charitable uſes. But as it was apprehended from recent experience, that perſons on their death-beds might make large and improvident diſpoſitions even for theſe good purpoſes, and defeat the political ends of the ſtatutes of mortmain; it is therefore enacted by the ſtatute 9 Geo. II. c. 36. that no lands or tenements, or money to be laid out thereon, ſhall be given for or charged with any charitable uſes whatſoever, unleſs by deed indented, executed in the preſence of two witneſſes 12 kalendar months before the death of the donor, and enrolled in the court of chancery within ſix months after its execution (except ſtocks in the public funds, which may be transferred within ſix months previous to the donor's death), and unleſs ſuch gift be made to take effect immediately, and be without power of revocation; and that all other gifts ſhall be void. The two univerſities, their colleges, and their ſcholars upon the foundation of the colleges of Eton, Wincheſter, and Weſtminſter, are excepted out of this act: but ſuch exemption was granted with this proviſo, that no college ſhall be at liberty to purchaſe more advowſons than are equal in number to one moiety of the fellows or ſtudents upon the reſpective foundations.

MORTON (Thomas), a learned Engliſh biſhop in the 17th century, was bred at St John's college, Cambridge, and was logic-lecturer of the univerſity. After ſeveral preferments he was advanced to the ſee of Cheſter in 1615, and tranſlated to that of Litchfield and Coventry in 1618; at which time he became acquainted with Antonio de Dominis archbiſhop of Spalatro, whom he endeavoured to diſſuade from returning to Rome. While he was biſhop of Litchfield and Coventry, in which ſee he ſat 14 years, he educated, ordained, and preſented to a living, a youth of excellent parts and memory, who was born blind; and detected the impoſture of the famous boy of Bilſon in Staffordſhire, who pretended to be poſſeſſed with a devil. In 1632 he was tranſlated to the ſee of Durham, in which he ſat with great reputation till the opening of the long parliament, which met in 1640; when he received great inſults from the common people, and was committed twice to cuſtody. The parliament, upon the diſſolution of biſhoprics, voted him 800 l. *per annum*, of which he received but a ſmall part. He died in 1659, in the 95th year of his age and 44th of his epiſcopal conſecration. He publiſhed *Apologia Catholica*, and ſeveral other works; and was a man of extenſive learning, great piety, and temperance.

MORTUARY, in law, is a ſort of eccleſiaſtical heriot *, being a cuſtomary gift claimed by and due to the miniſter in very many pariſhes on the death of his pariſhioners. They ſeem originally to have been only a voluntary bequeſt to the church; being intended, as Lyndewode informs us, from a conſtitution of archbiſhop Langham, as a kind of expiation and amends to the clergy for the perſonal tythes, and other eccleſiaſtical duties, which the laity in their life-time might have neglected or forgotten to pay. For this purpoſe, after the lord's heriot or beſt good was taken out, the ſecond beſt chattel was reſerved to the church as a mortuary. And therefore in the laws of king Canute, this mortuary is called *ſoul ſcot*, or *ſymbolum animæ*. And, in purſuance of the ſame principle, by the laws of Venice, where no perſonal tythes have been paid during the life of the party, they are paid at his death out of his merchandiſe, jewels, and other moveables. So alſo, by a ſimilar policy in France, every man that died without bequeathing a part of his eſtate to the church, which was called *dying without confeſſion*, was formerly deprived of Chriſtian burial; or, if he died inteſtate, the relations of the deceaſed, jointly with the biſhop, named proper arbitrators to determine what he ought to have given to the church, in caſe he had made a will. But the parliament, in 1409, redreſſed this grievance.

* See Heriot.

Mortuary.

It was anciently uſual in England to bring the mortuary to church along with the corpſe when it came to be buried; and thence it is ſometimes called a *corſe-preſent*: a term which beſpeaks it to have been once a voluntary donation. However, in Bracton's time, ſo early as Henry III. we find it rivetted into an eſtabliſhed cuſtom: inſomuch that the bequeſts of heriots and mortuaries were held to be neceſſary ingredients in every teſtament of chattles. *Imprimis autem debet quilibet, qui teſtamentum fecerit, dominum ſuum de meliori re quam habuerit recognoſcere; et poſtea eccleſiam de alia meliori:* the lord muſt have the beſt good left him as an heriot; and the church the ſecond beſt as a mortuary. But yet this cuſtom was different in different places: *in quibuſdam locis habet eccleſia melius animal de conſuetudine; in quibuſdam ſecundum, vel tertium melius; et in quibuſdam nihil: et ideo conſideranda eſt conſuetudo loci.* This cuſtom ſtill varies in different places, not only as to the mortuary to be paid, but the perſon to whom it is payable. In Wales a mortuary or corſe-preſent was due upon the death of every clergyman to the biſhop of the dioceſe; till aboliſhed, upon a recompence given to the biſhop, by the ſtatute 12 Ann. ſt. 2. c. 6. And in the archdeaconry of Cheſter a cuſtom alſo prevailed, that the biſhop, who is alſo archdeacon, ſhould have, at the death of every clergyman dying therein, his beſt horſe or mare, bridle, ſaddle, and ſpurs; his beſt gown or cloak, hat, upper garment under his gown, and tippet, and alſo his beſt ſignet or ring. But by ſtatute 28 Geo. II. c. 6. this mortuary is directed to ceaſe, and the act has ſettled upon the biſhop an equivalent in its room. The king's claim to many goods, on the death of all prelates in England, ſeems to be of the ſame nature; though Sir Edward Coke apprehends, that this is a duty upon death, and not a mortuary: a diſtinction which ſeems to be without a difference. For not only the king's eccleſiaſtical character, as ſupreme ordinary, but alſo the ſpecies of the goods claimed, which bear ſo near a reſemblance to thoſe in the archdeacony of Cheſter, which was an acknowledged mortuary, puts the matter out of diſpute. The king according to the record vouched by Sir Edward Coke, is entitled to ſix things; the biſhop's beſt horſe or palfrey, with his furniture; his cloak or gown, and tippet; his cup and cover; his baſon and ewer; his gold ring; and laſtly, his *muta canum*, his mew or kennel of hounds.

This variety of cuſtoms with regard to mortuaries, giving frequently a handle to exactions on the one ſide, and frauds or expenſive litigations on the other, it was thought proper by ſtatute 21 Henry VIII. c. 6.

to

Morus.

to reduce them to ſome kind of certainty. For this purpoſe it is enacted, that all mortuaries, or corſe-preſents to parſons of any pariſh, ſhall be taken in the following manner, unleſs where by cuſtom leſs or none at all is due: *viz.* for every perſon who does not leave goods to the value of ten marks, nothing: for every perſon who leaves goods to the value of ten marks and under 30 pounds, 3*s.* 4*d.* if above 30 pounds, and under 40 pounds, 6*s.* 8*d.* if above 40 pounds, of what value ſoever they may be, 10*s.* and no more. And no mortuary ſhall throughout the kingdom be paid for the death of any feme-covert; nor for any child; nor for any one of full age, that is not a houſekeeper; nor for any wayfaring man; but ſuch wayfaring man's mortuary ſhall be paid in the pariſh to which he belongs. And upon this ſtatute ſtands the law of mortuaries to this day.

MORUS, the MULBERRY-TREE: A genus of the tetrandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 53d order, *Scabridæ.* The male calyx is quadripartite; and there is no corolla; the female calyx is tetraphyllous; there is no corolla; two ſtyles; the calyx like a berry with one ſeed. There are ſeven ſpecies, viz.

Species. 1. The *nigra*, or common black-fruited mulberry-tree, riſes with an upright, large, rough trunk, dividing into a branchy and very ſpreading head, riſing 20 feet high, or more. It has large, heart-ſhaped, rough leaves; and monœcious flowers, ſucceeded in the females by large ſucculent black-berries. There is a variety with jagged leaves and ſmaller fruit.—2. The *alba*, or white mulberry-tree, riſes with an upright trunk, branching 20 or 30 feet high; garniſhed with large, oblique, heart-ſhaped, ſmooth, light-green, ſhining leaves, and monœcious flowers ſucceeded by pale-whitiſh fruit. There is a variety with purpliſh fruit. 3. The *papyrifera*, or paper mulberry-tree of Japan, grows 20 or 30 feet high; having large palmated leaves, ſome trilobate, others quinquelobed; and monœcious flowers, ſucceeded by ſmall black fruit.—4. The *rubra*, or red Virginia mulberry-tree, grows 30 feet high; is garniſhed with very large, heart-ſhaped, rough leaves, hairy underneath; and has monœcious flowers, ſucceeded by large reddiſh berries. 5. The *tinctoria*, dyer's mulberry, or fuſtic, has oblong leaves more extended on one ſide at the baſe, with axillary thorns. It is a native of Braſil and Jamaica. 6. The *tartarica*, or Tartarian mulberry, has ovate oblong leaves equal on both ſides and equally ſerrated. It abounds on the banks of the Wolga and the Tanais. 7. The *indica*, or Indian mulberry, has ovate oblong leaves, equal on both ſides, but unequally ſerrated.

The laſt three ſpecies are tender plants in this country; but the four firſt are very hardy, and ſucceed in any common ſoil and ſituation. The leaves are generally late before they come out, the buds ſeldom beginning to open till the middle or towards the latter end of May, according to the temperature of the ſeaſon; and when theſe trees in particular begin to expand their foliage, it is a good ſign of the near approach of fine warm ſettled weather; the white mulberry, however, is generally forwarder in leafing than the black. The flowers and fruit come out ſoon after the leaves; the males in amentums, and the females in ſmall roundiſh heads; neither of which are very conſpicuous, nor poſſeſs any beauty, but for obſervation. The female or fruitful flowers always riſe on the extremity of the young ſhoots on ſhort ſpurs; and with this ſingularity, that the calyxes of the flowers become the fruit, which is of the berry kind, and compoſed of many tuberances, each of them furniſhing one ſeed. The fruit matures here gradually from about the firſt of Auguſt until the middle of September. In dry warm ſeaſons, they ripen in great perfection; but when it proves very wet weather, they ripen but indifferently, and prove devoid of flavour.

Uſes, &c. Conſidered as fruit-trees, the nigra is the only proper ſort to cultivate here; the trees being not only the moſt plentiful bearers, but the fruit is larger and much finer-flavoured than that of the white kind, which is the only other ſort that bears in this country. The three next ſpecies are chiefly employed to form variety in ornamental plantations; tho' abroad they are adapted to more uſeful purpoſes.

The *fruit* of the black mulberry is exceedingly grateful to the taſte, and is conſidered at the ſame time as laxative and cooling. Like the other acid-ſweet fruits, it allays thirſt (as Dr Cullen obſerves), partly by refrigerating, and partly by exciting an excretion of mucus from the mouth and fauces; a ſimilar effect is alſo produced in the ſtomach, where, by correcting putreſcency, a powerful cauſe of thirſt is removed. A ſyrup is made from the berries gathered before they are ripe, which, taken as a gargle, is excellent for allaying inflammations of the throat, and for cleanſing ulcers in the mouth. The *bark* of the *root*, which has an acrid bitter taſte, poſſeſſes a cathartic power; and has been ſucceſsfully uſed as a vermifuge, particularly in caſes of tænia: the doſe is half a dram of the powder, or a dram of the infuſion. The juice of the black mulberry is alſo employed to give a colour to certain liquors and confections. Some make from it a wine which is not diſagreeable; others employ it for giving a high colour to red wine; which it likewiſe contributes to make ſweet.—Although this juice is of no uſe in dyeing, it gives a red colour to the fingers and to linen, which it is very difficult to remove. Verjuice, ſorrel, lemon, and green mulberries, remove ſpots of this kind from the hands: but with reſpect to linen, the beſt way is to wet the part which has been ſtained, and to dry it with the vapour of ſulphur; the vitriolic acid which eſcapes from this ſubſtance during combuſtion, inſtantly takes off the ſtain.—The *wood* of the mulberry tree is yellow, tolerably hard, and may be applied to various uſes in turnery and carving: But in order to ſeparate the bark, which is rough, thick, thready, and fit for being made into ropes, it is proper to ſteep the wood in water.

Mulberry trees are noted for their *leaves* affording the principal food of that valuable inſect the ſilkworm. The leaves of the *alba*, or white ſpecies, are preferred for this purpoſe in Europe; but in China, where the beſt ſilk is made, the worms are ſaid to be fed with thoſe of the *morus tartarica*. The advantages of *white mulberry* trees are not confined to the nouriſhment of worms: they may be cut every three or four years like ſallows and poplar trees, to make faggots;

and the ſheep eat their leaves, in wh[illegible] they are burſt. This kind of food, of [illegible] ex-tremely fond, is very nouriſhing; it [illegible] to the fleſh, and a fineneſs and beauty to the [illegible] fleece, in every climate and in moſt [illegible] be proper, as is the caſe in Spain, to wait for [illegible] before ſtriking off the leaves, which are gathered and placed to dry in ſheds or cart-houſes, taking care always to ſtir them from time to time. In Spain, the ſheep are fed on theſe leaves during the cold and froſts. By this method no injury is done to the mulberries, which produce leaves every year; and it is thought that the beauty and fineneſs of the Spaniſh wool is in a great meaſure owing to the uſe of this kind of food. From theſe conſiderations M. Bourgeois infers, that even in countries where, from the nature of the climate, the ſcarcity of workmen and the high price of labour, or any other particular cauſes, ſilk-worms could not be raiſed to any advantage, the cultivation of mulberry trees ought not be neglected.—The fruit of the white mulberry has a ſweetiſh and very inſipid taſte. Birds, however, are very fond of it; and it is remarked that thoſe which have been fed with ſuch fruit are excellent eating.

The *papyrifera*, or paper-mulberry, is ſo called from the paper chiefly uſed by the Japaneſe being made of the bark of its branches; (ſee the article Paper.) The leaves of this ſpecies alſo ſerve for food to the ſilk worm, and it is now cultivated with ſucceſs in France. It thrives beſt in ſandy ſoils, grows faſter than the common mulberry, and at the ſame time is not injured by the cold. M. de la Bouviere affirms that he procured a beautiful vegetable ſilk from the bark of the young branches of this ſpecies of mulberry, which he cut while the tree was in ſap, and afterwards beat and ſteeped. The women of Louiſiana procure the ſame kind of production from the ſhoots which iſſue from the ſtock of the mulberry; and which are four or five feet high. After taking off the bark, they dry it in the ſun, and then beat it that the external part may fall off; and the internal part, which is fine bark, remains entire. This is again beaten, to make it ſtill finer; after which they bleach it with dew. It is then ſpun, and various fabrics are made from it, ſuch as nets and fringes; they even ſometimes weave it and make it into cloth.—The fineſt ſort of cloth among the inhabitants of Otaheite and others of the South Sea Iſlands, is made of the bark of this tree, in the manner particularly deſcribed under the article Bark.

The *tinctoria* is a fine timber-tree, and a principal ingredient in moſt of our yellow dyes, for which it is chiefly imported into Europe. The berries are ſweet and wholeſome; but not much uſed, except by the winged tribe, by whoſe care it is chiefly planted.

Culture of the Mulberry. From the nouriſhment which it affords to the ſilk-worm, that valuable inſect to which we are indebted for the materials of our fineſt ſtuffs, the method of cultivating the mulberry tree muſt be peculiarly intereſting wherever its culture can be undertaken with ſucceſs. In France and Italy, vaſt plantations of the trees are made ſolely for their leaves to feed the little animals we have mentioned, which amply reward the poſſeſſors with the ſupply of ſilk which they ſpin from their bowels. Plantations of the mulberry have at different times been recommended in England for the ſame purpoſe; though nothing has yet been done in that way to any extent, and even the expediency of any ſuch attempt has been doubted by others, upon the ground of its interfering with other branches of rural economies more productive and more congenial to the climate.

In the European ſilk countries, a great many varieties of mulberry trees are diſtinguiſhed, ariſing from difference of climate, ſoil, method of culture, and other accidental cauſes. Among the wild mulberries, we meet with ſome whoſe leaves are roundiſh and reſembling thoſe of a roſe: hence they have been called the *roſe-leaved* mulberry.

Mulberry trees were firſt cultivated in France in the reign of Charles IX. It has been found by experience that this tree is not ſo peculiar to warm countries, ſuch as Spain, Italy, Provence, Languedoc, and Piedmont; but it may alſo thrive very well in colder countries, ſuch as Touraine, Poitou, Maine, Anjou, Angoumois near Rochefoucault, and even in Germany, where it affords very good nouriſhment for ſilk-worms. They grow in all kinds of ſoil: they thrive beſt in ſtrong and wet lands; but it is alleged that their leaves conſtitute too coarſe food, prejudicial to the worms, and unfavourable to the quality of the ſilk.—A good light land is the beſt kind of ſoil for raiſing them. White mulberry trees have been found to grow in ſandy ſoils where heath would ſcarcely vegetate; but their leaves are too dry, and afford not ſufficient nouriſhment for the ſilk-worms.

Mulberry trees may be propagated either from ſhoots which have taken root, or by ſeed, by layers, and by ſlips. To raiſe black mulberry trees, the ſeed muſt be taken from the largeſt and moſt beautiful mulberries: in raiſing white ones, the ſeed is taken from the fineſt mulberries growing on trees with large whitiſh ſoft and tender leaves, and as little cut as poſſible. The beſt ſeed is commonly got from Piedmont, Languedoc, &c. According to M. Duhamel, that ſeed ſhould be preferred which is gathered in counties where the cold is ſometimes pretty ſevere; becauſe in that caſe the trees are better able to reſiſt the attacks of the froſt. It frequently happens in ſevere winters, as M. Bourgeois obſerves, that the ſtalks of the young mulberry trees, eſpecially during the firſt winter, are deſtroyed by the froſt; but when they are cut cloſe to the earth, they ſend forth as beautiful and vigorous ſtalks as the former. Good ſeed ought to be large, heavy, light coloured, to produce a great deal of oil when it is preſſed, and to crackle when thrown on a red hot ſhovel. This ſeed muſt be ſown in good land.

In the autumn of the ſecond year, all thoſe trees muſt be pulled up which have ſmall leaves of a very deep green, rough, and deeply indented, for they would produce no leaves proper for the ſilk worms.—In the third year, when the mulberry tree is about the thickneſs of the finger, it muſt be taken up and put in the nurſery. According to M. Bourgeois, mulberries ought to be tranſplanted in the ſpring of the ſecond year, which makes them thrive better, and ſooner attain their growth. Without this tranſplantation, they would put forth only one root like a pivot and moſt of them would be in danger of periſhing when they are taken up to be put where they are in-

[illegible] tended to remain. Some cultivators of this tree tell us, that all the young trees, whether large or ſmall, ſtraight or crooked, ought to be cut cloſe to the ground in the third year, that they may put forth a greater number of roots. Others never employ this method but with regard to thoſe which are crooked, or in a languiſhing ſtate.

White mulberries may be raiſed for the food of ſilk-worms, either in the form of a copſe, or planted in a regular order, by letting them grow to their natural ſize. Ingrafting is one of the ſureſt methods of procuring fine leaves from mulberries. Mulberries ingrafted on wild ſtocks choſen from a good kind, ſuch as thoſe which are produced from the ſeed of the Italian mulberry, commonly called the *roſe-mulberry*, or of the Spaniſh mulberry, produce, as M. Bourgeois obſerves, much more beautiful leaves, and of a much better quality for ſilk-worms, than thoſe which are ingrafted on the common or prickly ſmall-leafed wild-ſtock. The ſame obſervation has been made by a great many cultivators of mulberries, and in particular by M. Thomé of Lyons, whoſe authority has the greateſt weight in whatever regards the cultivation of mulberries and the rearing of ſilk-worms. Encyclop. Methodique.

Ingrafted mulberries, it muſt be confeſſed, produce a greater number of leaves, and theſe more nouriſhing for ſilk-worms, than wild mulberries. The latter, however, it has been found by experience, may exiſt for two centuries; whereas the extenſion of leaves produced by ingrafting, occaſions a premature diſſipation of the ſap of the tree, and thereby accelerates its decay. In a memoir inſerted in a treatiſe on the culture of white mulberries by M. Pomier, it is recommended to ingraft white mulberries upon black ones; and there is reaſon to think that by following this plan the trees would exiſt much longer: for it is well known that the white mulberry commonly decays firſt in the root, whereas the black mulberry is not ſubject to any malady. In almoſt all the books on agriculture we find it aſſerted, that mulberries may be ingrafted on elms. "I will not affirm (ſays M. Duhamel), that this method of ingrafting has never been ſucceſsful; but I have frequently tried it in vain, and I have many reaſons for thinking that it cannot be attended with any advantage." In works of the ſame kind, we are likewiſe told, "that mulberries may be ingrafted on fig and lime trees; but in general ſuch ingrafting will not ſucceed, unleſs there is a great analogy betwixt the trees, and particularly unleſs the ſap is ſet in motion at the ſame time."

The greater care we take of mulberries, by dreſſing them, and lopping off the overgrown branches, they produce the greater plenty of good leaves. It is very prejudicial to the mulberries to ſtrip them when too young of their leaves for the purpoſe of feeding the worms, becauſe the leaves are the organs of perſpiration in trees, and likewiſe contribute greatly to nutrition by means of their abſorbing veſſels which imbibe the moiſture of the atmoſphere. Mulberry trees are ſo plentifully ſtored with ſap, that they renew their leaves ſometimes twice or thrice. When the winter is mild, mulberry trees put forth their leaves very early: but it is always dangerous to accelerate the hatching of the worms in expectation of this event; for no leaves can be depended upon till the beginning of May, thoſe which are prior to this period being in danger of being deſtroyed by the froſts. [illegible]

In Tuſcany, eſpecially in the neighbourhood of Florence, M. Nollet tells us, that though the inhabitants do not cultivate half ſo many mulberries as the Piedmonteſe, they rear and feed double the quantity, in proportion, of ſilk-worms. For this purpoſe they cauſe the worms to hatch only at two different ſeaſons. The firſt worms which are hatched are fed on the firſt produce of the mulberry-trees; and when theſe have produced their ſilk, other worms are hatched, which are nouriſhed on the ſecond crop of the ſame trees.

We are told by M. Bourgeois, that ſeveral kinds of white mulberries are now cultivated near Bienne in Switzerland. According to this author, the prickly mulberry is the leaſt eſteemed of all the white wild mulberries. Its branches are rough with prickles; its leaves are of a ſmall ſize and few in number; and the reaping of them is difficult and expenſive. The common wild mulberry produces indented leaves, oblong, and very ſlender; but it is worth being attended to, becauſe it thrives very well when planted in a hedge, and in a favourable expoſure: it is alſo earlier in the ſpring than the other ſpecies. The wild mulberry, which is produced from the roſe or Italian ingrafted mulberry, bears a great many leaves, of a roundiſh ſhape and middling ſize, inclining to a light yellow, and of an excellent quality.

Of the white ingrafted mulberry-trees, the roſe, or Italian ingrafted mulberry, which is now the ſpecies moſt cultivated in France, Italy, and Piedmont, produces great abundance of large, thick and ſmooth leaves. It has now come into great repute, in conſequence of the recommendation of M. Thomé, who prefers it to all other ſpecies of mulberry-trees for raiſing ſilk-worms. It is extremely delicate, however, and ſuffered greatly in Switzerland from the ſevere winters of 1766 and 1767. The mulberry called *Roman leaf* is diſtinguiſhed from every other ſpecies by its very large leaves, ſome of which are frequently found equal in ſize to thoſe of a gourd. The Spaniſh mulberry greatly reſembles the wild roſe-mulberry, except that its leaves are larger and more pointed. It is by no means delicate, and can reſiſt the ſtrongeſt froſts and the ſevereſt winters in cold climates. The leaves of the mulberry called the *ſmall queen* are oblong, moderately large, and exceedingly ſmooth: This ſpecies is of an excellent quality and much eſteemed.

MOSA, (anc. geog.) a river of Belgica, riſing in mount Vogeſus on the borders of the Lingones, and which, after receiving a part of the Rhine called *Vahalis*, forms the iſland of the Batavi, and paſſes off into the ſea, at no greater diſtance than 80 miles: its mouth, which is large and broad, is that which Pliny calls *Helius*, denoting *Lower*, according to ſome German writers. Now called the *Maeſe*, or *Meuſe*; riſing in Champaign, on the borders of the county of Burgundy, or the Franche Compté, at a village called *Meuſe*, whence the appellation; and running north through Lorrain and Champaign into the Netherlands: it afterwards directs its courſe north-eaſt, and then weſt; and joining the Waal, runs to Dort, and falls into the German ſea, a little below the Briel.—According to Baudrand, it twice receives the Waal; by the firſt junction forming the iſland Bommel; and again receives it at Worcum, from which place proceeding to Dort, it divides into two branches, which again uniting together form one large mouth diſcharging itſelf into the German ſea.

MOSÆ Pons (anc. geog.), ſuppoſed to be Maeſtricht, ſituated on the Maeſe. E. Long. 5. 40. N. Lat. 50 55.

Wilſon's Archæol. Dict.

MOSAIC law, or the *Law of Moses*, is the moſt ancient that we know of in the world, and is of three kinds; the moral law, the ceremonial law, and the judicial law. The different manner in which each of theſe was delivered, may perhaps ſuggeſt to us a right idea of their different natures. The moral law, or ten commandments, for inſtance, was delivered on the top of the mountain, in the face of the whole world, as being of univerſal influence, and obligatory on all mankind. The ceremonial was received by Moſes in private in the tabernacle, as being of peculiar concern, belonging to the Jews only, and deſtined to ceaſe when the tabernacle was down, and the vail of the temple rent. As to the judicial law, it was neither ſo publicly nor ſo audibly given as the moral law, nor yet ſo privately as the ceremonial; this kind of law being of an indifferent nature; to be obſerved or not obſerved, as its rites ſuit with the place and government under which we live. The five books of Moſes called the *Pentateuch*, are frequently ſtyled, by way of emphaſis, *the Law*. This was held by the Jews in ſuch veneration, that they would not allow it to be laid upon the bed of any ſick perſon, leſt it ſhould be polluted by touching the dead.

A TABLE or HARMONY of the MCSAIC LAW, digeſted into proper Heads, with Refrences to the ſeveral Parts of the Pentateuch where the reſpective Laws occur.

Class I. The Moral Law written on the two Tables, containing the Ten Commandments.	Exod. chap.	Levitic. chap.	Numb. chap.	Deut. chap.
The *firſt table*, which includes				
The firſt commandment,	20. 23.	—	—	5. 6. 13.
The ſecond commandment,	20. 23. 34.	19. 20. 26.	—	4. 5. 6. 7. 8. 10. 11. 12. 13.
The third commandment,	20. 23.	—	—	5.
The fourth commandment,	20. 23. 31. 34. 35.	19. 23. 26.	—	—
The *ſecond table*, including				
The fifth commandment,	20. 22.	19.	—	5.
The ſixth commandment,	20.	19.	—	5.
The ſeventh commandment,	20.	18. 19.	—	5. 23.
The eighth commandment,	20. 23.	19.	—	5.
The ninth commandment,	20. 23.	19.	—	5.
The tenth commandment,	20.	—	—	5.
The ſum of both tables,	—	19.	—	6.
Class II. The Ceremonial Law may be fitly reduced to the following heads, *viz.*				
Of the holy place,	20.	17.	—	12.
Of the matter and ſtructure of the tabernacle,	25. 26. 27. 35.	—	—	—
Of the inſtruments of the ſame, *viz.*				
The laver of braſs,	30.	—	—	—
The altar of burnt offering,	27.	—	—	—
The altar of incenſe,	30.	—	—	—
The candleſtick of pure gold,	25.	—	—	—
The table of ſhew-bread,	25. 26.	—	—	—
Of the prieſts and their veſtments for glory and beauty,	28.	—	—	—
Of the chooſing of the Levites,	—	—	18. 3. 8.	—
Of the prieſt's office in general,	—	—	3. 18.	—
Of their office in teaching,	—	19. 10.	—	18. 12. 17. 31.
Of their office in bleſſing,	—	—	6.	—
Of their office in offering; which function largely ſpreading itſelf, is divided into theſe heads, *viz.*				
What the ſacrifice ought to be,	—	22.	—	15. 17.
Of the continual fire,	—	6.	—	—
Of the manner of the burnt offerings,	—	6. 7.	—	—
————the peace offerings,	—	3. 7.	—	—

	Exod. chap.	Levitic. chap.	Numb. chap.	Deut. chap.
Of the manner of the ſacrifices, according to their ſeveral kinds, *viz.*				
For ſin committed through ignorance of the law,	—	4.	5.	—
For ſin committed through ignorance of the fact,	—	5. 7.	—	—
For ſin committed wittingly, yet not through impiety,	—	6.	5.	—
The ſpecial law of ſacrifices for ſin,	—	6. 7.	—	—
Of things belonging to the ſacrifices,	—	2. 6. 7.	15.	—
Of the ſhew-bread,	—	24.	—	—
Of the lamps,	27.	24.	8.	—
Of the ſweet incenſe,	30.	—	—	—
Of the uſe of ordinary oblations, whereof there were ſeveral kinds obſerved by the prieſts,				
Of the conſecration of the high prieſts and other prieſts,	29. 30.	6. 8.	—	—
Of the conſecration and office of the Levites,	—	—	8.	—
Of the dwelling of the Levites,	—	—	35.	—
Of the anointing the altar, and all the inſtruments of the tabernacle,	29. 30.	—	—	—
Of the continual daily ſacrifices,	29.	—	28.	—
Of the continual ſabbath-day's ſacrifice,	—	—	28.	—
Of the ſolemn ſacrifice for feaſt-days, which were diverſe, and had peculiar rites, diſtinguiſhed into theſe, *viz.*				
Of trumpets,	—	—	10.	—
Of beginning of months,	—	—	28.	—
Of the three moſt ſolemn feaſts in general,	23. 34.	23.	—	16.
Of the feaſt of paſſover,	12. 13. 25. 34.	23.	9. 28.	16.
Of the feaſt of pentecoſt,	23. 24.	23.	28.	16.
Of the feaſt of tabernacles,	23. 34.	23.	29.	16.
Of the feaſt of blowing the trumpets,	—	23.	29.	—
Of the feaſt of expiation,	30.	16. 13.	29.	—
Of the firſt fruits,	22. 23. 34.	2.	15.	26.
Of tythes,	—	21.	18.	12. 14. 26.
Of fruits growing and not eaten of,	—	19.	—	—
Of the firſt born,	13. 22. 34.	—	—	15.
Of the ſabbatical year,	23.	25.	—	—
Of the year of jubilee,	—	25.	—	—
Of vows in general,	—	27.	30.	13.
What perſons ought not to make vows,	—	—	30.	—
What things cannot be vowed,	—	27.	—	23.
Of redemption of vows,	—	27.	—	—
Of the vows of the Nazarites,	—	—	6.	—
Of the laws proper for the prieſts, *viz.*				
Of pollutions,	—	22.	—	—
Of the high prieſt's mourning,	—	21.	—	—
Of his marriage,	—	21.	—	—
Of the mourning of the ordinary prieſts,	—	21.	—	—
Of their marriage,	—	21.	—	—
Of their being forbid the uſe of wine, &c.	—	10.	—	—
Of ſanctified meats,	— —	6. 17. 19. 20.	5. 18.	12. 15. 18.
Of the office of the Levites, *viz.*				
Teaching,	—	—	—	17. 27. 31.
Offering,	—	—	3. 4. 18.	10.
Other promiſcuous ceremonial laws, *viz.*				
Of uncleanneſs in general,	—	15. 19.	5.	—
Of uncleanneſs in meats, *viz.*				
Of blood, Gen. ix.	23.	7. 17. 19.	—	12.
Of fat,	—	3. 7.	—	—
Of dead carcaſes,	22.	17.	—	14.
Other meats, and diverſe living creatures,	—	11. 20.	—	14.
Of uncleanneſs in the iſſue of ſeed and blood,	—	15. 12.	—	23.
In the dead bodies of men,	—	—	19.	—
In the leproſy,	—	13. 14.	5.	—

Mosaic Law.		Exod. chap.	Levitic. chap.	Numb. chap.	Deut. chap.
Of circumciſion,	Gen. xvii.	—	12.	—	—
Of the water of expiation,		—	—	19.	—
Of the mourning of the Iſraelites,		—	19.	—	14.
Of mixtures,		—	19.	—	14.
Of their garments, and writing the law privately,		—	—	15.	6. 11. 22.
Of young birds not to be taken with the dam,		—	—	—	22.
Of their paddle ſtaves,		—	—	—	23.
CLASS III. The Political Law.					
N. B. The Magiſtrate is the Keeper of the Precepts of both Tables, and to have reſpect to human Society:—therefore the Political Laws of the Iſraelites are referred to both the Tables, and are to be reduced to the ſeveral Precepts of the Moral Law.					
Laws referred to the firſt table, namely,					
1ſt, To the firſt and ſecond commandments, *viz.*					
Of idolators and apoſtates,		22.	20.	—	13. 17.
Of aboliſhing idolatry,		23. 24.	—	33.	7. 12.
Of diviners and falſe prophets,		22.	19. 20.	—	18.
Of covenants with other gods,		23. 34.	—	—	7.
2d. To the third commandment, *viz.*					
Of blaſphemies,		—	24.	15.	—
3d. To the fourth commandment, *viz.*					
Of breaking the ſabbath,		31. 35.	—	15.	—
Political laws referred to the ſecond table,					
1ſt. To the fifth commandment, *viz.*					
Of magiſtrates and their authority, Of the power of fathers,		18. 30.	—	11.	1. 13. 17. [23.
2d. To the ſixth commandment, *viz.*					
Of capital puniſhments,		—	—	—	21. 24.
Of wilful murder,		21.	24.	35.	19.
Of manſlaughter unwittingly committed, and of the cities of refuge,		21.	—	35.	19. 21. 22.
Of heinous injury,		21.	24.	—	25.
Of puniſhments not capital,		—	—	—	25.
Of the law of war,		—	—	—	25.
3d. To the ſeventh commandment, *viz.*					
Of unlawful marriages,		—	18. 20.	—	7. 21.
Of fornication,		—	19.	—	23.
Of whoredom,		22.	21.	—	22.
Of adultery and jealouſy,		—	19. 20.	—	—
Of copulation againſt nature,		22.	18. 20.	—	—
Of divorcements,		—	—	—	24.
Other matrimonial laws,		21.	18. 20.	—	21. 22. 24. [25.
4th. To the eighth commandment, *viz.*					
Of the puniſhment of thefts,		22.	—	5.	—
Of ſacrilege,	Joſhua vii.	—	—	—	—
Of not injuring ſtrangers,		22. 23.	19.	—	10.
Of not defrauding hirelings,		—	19.	—	26. 25.
Of juſt weights,		—	19.	—	25.
Of removing the land-mark,		—	—	—	19.
Of loſt goods,		22.	—	—	
Of ſtray cattle,		22. 23.	—	—	22.
Of corrupted judgments,		23.	19.	—	16. 24.
Of fire breaking out by chance,		22.	—	—	—
Of man-ſtealing,		—	—	—	24.
Of the fugitive ſervant,		—	—	—	23.

	Exod. chap.	Levitic. chap.	Numb. chap.	Deut. chap.
Of gathering fruits,	—	19. 23.	—	23. 24.
Of contracts, *viz.*				
Borrowing,	—	—	—	15.
Of the pledge,	22.	—	—	24.
Of uſury,	22.	25.	—	23.
Of ſelling,	21.	25.	—	15.
Of the thing lent,	22.	—	—	—
Of a thing committed to be kept,				
Of heirs,				
5th. To the ninth commandment, viz.				
Of witneſſes,	—	5.	—	17. 19
The eſtabliſhing the political law,	—	—	—	4.
The eſtabliſhing the divine law in general,	—	—	—	6.11.29. 30. 31.
From the dignity of the lawgiver,	—	19.20.22.	15.	4.5.6.7.8. 10. 26.27.
From the excellency of the laws,	—	—		4. 26.
From the promiſes,	15.19.23. 24.	18.26.	—	4. 5.6. 7. 10. 11.12. 28.
From the threatnings,	23.	26.	—	4. 7. 11. 27.28.29. 30.

MOSAIC, or Mosaic-work, an aſſemblage of little pieces of glaſs, marble, precious ſtones, &c. of various colours, cut ſquare, and cemented on a ground of ſtucco, in ſuch a manner as to imitate the colours and gradations of painting. The critics are divided as to the origin and reaſon of the name. Some derive it from *moſaicum*, a corruption of *muſaicum*, as that is of *muſivum*, as it was called among the Romans. Scaliger derives it from the Greek *μȣσα*, and imagines the name was given to this ſort of works as being very fine and ingeneous. Nebricenſis is of opinion it was ſo called, becauſe *ex illis picturis ornabantur muſea.*

1. The method of performing Moſaic work of *glaſs* is this: provide little pieces of glaſs, of as many different colours and ſizes as poſſible.

Now, in order to apply theſe ſeveral pieces, and out of them to form a picture, they in the firſt place procure a cartoon or deſign to be drawn; this is tranſferred to the ground or plaſter by calking, as in painting in freſco. See Fresco.

As this plaſter is to be laid thick on the wall, and therefore will continue freſh and ſoft a conſiderable time, ſo there may be enough prepared at once to ſerve for as much work as will take up three or four days.

This plaſter is compoſed of lime made of hard ſtone, with brick-duſt very fine, gum tragacanth, and whites of eggs: when this plaſter has been thus prepared and laid on the wall, and made the deſign of what is to be repreſented, they take out the little pieces of glaſs with a pair of plyers, and range them one after another, ſtill keeping ſtrictly to the light, ſhadow, different teints, and colours repreſented in the deſign before; preſſing or flatting them down with a ruler, which ſerves both to ſink them within the ground and to render the ſurface even.

Thus, in a long time, and with a great deal of labour, they finiſh the work, which is ſtill the more beautiful, as the pieces of glaſs are more uniform, and ranged at an even height.

Some of theſe pieces of moſaic-work are performed with that exactneſs, that they appear as ſmooth as a table of marble, and as finiſhed and maſterly as a painting in freſco; with this advantage, that they have a fine luſtre, and will laſt ages.

The fineſt works of this kind that have remained till our time, and thoſe by whom the moderns have retrieved the art, which was in a manner loſt, are thoſe in the church of St Agnes, formerly the temple of Bacchus, at Rome; and ſome at Piſa, Florence, and other cities of Italy. The moſt eſteemed among the works of the moderns are thoſe of Joſeph Pine and the Chevalier Lanfranc, in the church of St Peter at Rome: there are alſo very good ones at Venice.

2. The method of performing Moſaic-work of *marble* is this: The ground of Moſaic-works, wholly marble, is uſually a maſſive marble, either white or black. On this ground the deſign is cut with a chiſel, after it has been firſt calked. After it has been cut off a conſiderable depth, *i. e.* an inch or more, the cavities are filled up with marble of a proper colour, firſt faſhioned according to the deſign, and reduced to the thickneſs of the indentures with various inſtruments. To make the piece thus inſerted into the indentures cleave faſt, whoſe ſeveral colours are to imitate thoſe of the deſign, they uſe a ſtucco, compoſed of lime and marble-duſt; or a kind of maſtic, which is prepared by each workman, after a different manner peculiar to himſelf. The figures being marked out, the painter or ſculptor himſelf draws with a pencil the colours of the figures not determined by the ground, and in the ſame manner makes ſtrokes or hatchings in the place where ſhadows are to be: and after he has engraven with the chiſel all the ſtrokes thus drawn, he fills them up with a black maſtic, compoſed partly of Burgundy-pitch poured on hot; taking off afterwards what is ſuperfluous with a

piece of ſoft ſtone or brick, which together with water and beaten cement, takes away the maſtic, poliſhes the marble, and renders the whole ſo even that one would imagine it only conſiſted of one piece. This is the kind of Moſaic-work that is ſeen in the pompous church of the invalids at Paris, and the fine chapel at Verſailles, with which ſome entire apartments of that palace are incruſtated.

3. As for Moſaic-work of precious ſtones, other and finer inſtruments are required than thoſe uſed in marble; as drills, wheels, &c. uſed by lapidaries and engravers on ſtone. As none but the richeſt marbles and ſtones enter this work, to make them go the farther, they are ſawn into the thinneſt leaves imaginable, ſcarce exceeding half a line in thickneſs; the block to be ſawn is faſtened firmly with cords on the bench, and only raiſed a little on a piece of wood, one or two inches high. Two iron pins, which are on one ſide the block and which ſerve to faſten it, are put into a vice contrived for the purpoſe; and with a kind of ſaw or bow, made of fine braſs-wire, bent on a piece of ſpongy wood together with emery ſteeped in water, the leaf is gradually faſhioned by following the ſtroke of the deſign, made on paper, and glued on the piece. When there are pieces enough faſtened to form an entire flower, or ſome other part of the deſign, they are applied to the ground.

The ground which ſupports this Moſaic-work is uſually of free-ſtone. The matter with which the ſtones are joined together is a maſtic, or kind of ſtucco, laid very thin on the leaves as they are faſhioned; and this being done, the leaves are applied with plyers.

If any contour, or ſide of a leaf, be not either ſquared or rounded ſufficiently, ſo as to fit the place exactly into which it is to be inſerted, when it is too large, it is to be brought down with a braſs file or raſp; and if it be too little, it is managed with a drill and other inſtruments uſed by lapidaries.

Moſaic-work of marble is uſed in large works, as in pavements of churches, baſilics, and palaces; and in the incruſtation and vaneering of the walls of the ſame edifices.

As for that of precious ſtones, it is only uſed in ſmall works, as ornaments for altar pieces, tables for rich cabinets, precious ſtones being ſo very dear.

4. Manner of performing Moſaic-work of *gypſum*. Of this ſtone calcined in a kiln beaten in a mortar, and ſifted, the French workmen made a ſort of artificial marbles, imitating precious ſtones; and of theſe they compoſe a kind of Moſaic-work, which does not come far ſhort either of the durableneſs or the vivacity of the natural ſtones; and which beſides has this advantage, that it admits of continued pieces or painting of entire compartiments without any viſible joining.

Some make the ground of plaſter of Paris, others of free-ſtone. If it be of plaſter of Paris they ſpread it in a wooden frame, of the length and breadth of the work intended, and in thickneſs about an inch and a half. This frame is ſo contrived, that the tenons being only joined to the mortiſes by ſingle pins, they may be taken aſunder, and the frame be diſmounted when the plaſter is dry. The frame is covered on one ſide with a ſtrong linen cloth, nailed all round; which being placed horizontally with the linen at the bottom, is filled with plaſter paſſed through a wide ſieve. When the plaſter is half dry, the frame is ſet up perpendicularly, and left till it is quite dry; then it is taken out, by taking the frame to pieces.

In this Moſaic, the ground is the moſt important part. Now in order to the preparation of this ſifted gypſum, which is to be applied on this ground, it is diſſolved and boiled in the beſt Engliſh glue, and mixed with the colour that it is to be of; then the whole is worked up together into the uſual conſiſtence of plaſter, and then is taken and ſpread on the ground five or ſix inches thick. If the work be ſuch, as that mouldings are required, they are formed with gouges and other inſtruments.

It is on this plaſter, thus coloured like marble or precious ſtone, and which is to ſerve as a ground to a work, either of lapis, agate, alabaſter, or the like, that the deſign to be repreſented is drawn; having been firſt pounced or calqued. To hollow or impreſs the deſign they uſe the ſame inſtrumenss that ſculptors do; the ground whereon they are to work not being much leſs hard than the marble itſelf. The cavities being thus made in the ground, are filled with the ſame gypſum boiled in glue, only differently coloured, and thus are the different colours of the original repreſented. In order that the neceſſary colours and teints may be ready at hand, the quantities of the gypſum are tempered with the ſeveral colours in pots. After the deſign has been thus filled and rendered viſible, by half-poliſhing it with brick and ſoft ſtone, they go over it again, cutting ſuch plates as are either to be weaker or more ſhadowed, and filling them with gypſum; which work they repeat till all the colours being aded one after the other, repreſent the original to the life. When the work is finiſhed, they ſcour it with ſoft ſtone, ſand, and water; after that, with a pumice-ſtone; and in the laſt place poliſh it with a wooden mullet and emery. Laſtly, they give it a luſtre, by ſmearing it over with oil, and rubbing it a long time with the palm of the hand, which gives it a luſtre no ways inferior to that of natural marble.

5. In Clavigero's hiſtory of Mexico is deſcribed a curious kind of Moſaic-work made by the ancient Mexicans of the moſt delicate and beautiful *feathers* of birds. They raiſed for this purpoſe various ſpecies of birds of fine plumage with which that country abounds, not only in the palaces of the king, where there were all ſorts of animals, but likewiſe in private houſes; and at certain ſeaſons they carried off their feathers to make uſe of them on this kind of work, or to ſell them at market. They ſet a high value on the feathers of thoſe wonderful little birds which they call *Huitzitzilin*, and the Spaniards *Picaflores*, on account of the ſmallneſs, the fineneſs, and the various colours of them. In theſe and other beautiful birds, nature ſupplied them with all the colours which art can produce, and alſo ſome which art cannot imitate. At the undertaking of every Moſaic-work ſeveral artiſts aſſembled: After having agreed upon a deſign, and taken their meaſures and proportions, each artiſt charged himſelf with the execution of a certain part of the image, and exerted himſelf ſo diligently in it with ſuch patience and application, that he frequently ſpent a whole day in adjuſting a feather; firſt trying one, then another, viewing it ſometimes one way, then

another, until he found one which gave his part that ideal perfection propoſed to be obtained. When the part which each arrtiſt undertook was done, they aſſembled again to form the entire image from them. If any part was accidentally the leaſt deranged, it was wrought again until it was perfectly finiſhed. They laid hold of the feathers with ſmall pincers, that they might not do them the leaſt injury, and paſted them on the cloth with *tzauhtli*, or ſome other glutinous matter; then they united all the parts upon a little table, or a plate of copper, and flattened them ſoftly until they left the ſurface of the image ſo equal and ſmooth that it appeared to be the work of a pencil.

Theſe were the images ſo much celebrated by the Spaniards and other European nations. Whoever beheld them was at a loſs whether he ought to have praiſed moſt the life and beauty of the natural colours, or the dexterity of the artiſt and the ingenious diſpoſition of art. "Theſe images (ſays Acoſta) are deſervedly admired; for it is wonderful how it was poſſible, with the feathers of birds, to execute works ſo fine and ſo equal, that they appear the performance of the pencil; and what neither the pencil nor the colours in painting can effect, they have, when viewed from a ſide, an appearance ſo beautiful, ſo lively, and animated, they give delight to the ſight. Some Indians, who are able artiſts, copy whatever is painted with a pencil ſo perfectly with plumage, that they rival the beſt painters of Spain." Theſe works of feathers were even ſo highly eſteemed by the Mexicans as to be valued more than gold. Cortes, Bernal Diaz, Gomara, Torquemada, and all the other hiſtorians who ſaw them, were at a loſs for expreſſions ſufficient to praiſe their perfection. Several works of this kind, our author ſays, are ſtill preſerved in the muſeums of Europe, and many in Mexico; but few, he apprehends, belong to the ſixteenth century, and ſtill fewer, if any, are of thoſe made before the conqueſt. The Moſaic-works alſo which the Mexicans made of broken ſhells was extremely curious: this art is ſtill practiſed in Guatimala.

MOSAMBIQUE, a kingdom of Africa, lying ſouth of Quiloa, and taking its name from the chief town, which is ſituated on an iſland, at the mouth of a river of the ſame name, in 15 deg. S. Lat. The iſland is 30 miles in circumference, and very populous, though the air is ſaid to be very hot, and the ſoil in general dry, ſandy, and barren; yet they have moſt of the tropical fruits, with black cattle, hogs, and ſheep. There is a kind of fowl here, both the feathers and fleſh of which are black, inſomuch that, when they are boiled, the broth looks like ink; and yet their fleſh is very delicate and good food. The town of Moſambique is regularly fortified, and has a good harbour, defended by a citadel, with ſeveral churches and monaſteries. The Portugueſe ſhipping to and from India touch here for refreſhments. As the iſland abounds in cattle, the Portugueſe ſlaughter and ſalt up a great deal of beef, which they afterwards ſend to the Brazils, or ſell to the European ſhipping. They alſo barter European goods with the natives for gold elephants teeth, and ſlaves. There is another town, called *Morgale*, ſituated alſo on an iſland, and garriſoned by the Portugueſe, being their chief magazine for European goods. The gold they receive from the natives is found near the ſurface of the earth, or in the ſands of rivers; no gold mines, or at leaſt very few, being at preſent wrought in Africa.

MOSCHION, a name common to four different writers, whoſe compoſitions, character, and native place, are unknown. Some fragments of their writings remain, ſome few verſes, and a treatiſe *De Mulierum affectibus*.

MOSCHUS, a Grecian poet of antiquity, uſually coupled with Bion; and they were both of them cotemporaries with Theocritus. In the time of the latter Grecians, all the ancient Idyliums were collected and attributed to Theocritus; but the claims of Moſchus and Bion have been admitted to ſome few little pieces; and this is ſufficient to make us inquiſitive about their characters and ſtory: yet all that can be known about them muſt be collected from their own remains. Moſchus, by compoſing his delicate elegy on Bion, has given the beſt memorials of Bion's life. See Bion. Moſchus and Theocritus have by ſome critics been ſuppoſed the ſame perſon; but there are irrefragable evidences againſt it: others will have him as well as Bion to have lived later than Theocritus, upon the authority of Suidas: while others again ſuppoſe him to have been the ſcholar of Bion, and probably his ſucceſſor in governing the poetic ſchool; which, from the elegy of Moſchus, does not ſeem unlikely. Their remains are to be found in all the editions of the *Poetæ Minores*.

Plate CCCXV.

MOSCHUS, in zoology, a genus of quadrupeds of the order of pecora, having no horns. There are eight ſmall cutting teeth in the lower jaw; in the upper, no cutting or fore teeth; but two long tuſks, one on each ſide, projecting out of the mouth

1. The moſchiferus, or Thibet muſk, has a bag or tumour on the belly near the navel, and a very ſhort tail almoſt hid in the fur. The length of the male is about three feet three inches from the noſe to the origin of the tail, and about two feet three inches high at the ſhoulder; the female is leſs than the male, has a ſharper noſe, has no tuſks nor muſk-bag, and is provided with two teats. The head reſembles that of the roe: the fur is coarſe like that of the animals of the deer hind; but ſofter, very ſmooth, erect, plentiful, thick, and long: the colour varies according to the age of the animal and time of the year; but is chiefly blackiſh brown on the upper, and hoary, ſeldom white, on the under parts of the body; the hoofs are long, black, and much divided, and the ſpurious hoofs of the fore feet are very long: the ſcrotum is of a bright red colour, and the penis very ſmall. It inhabits the Aſiatic Alps, eſpecially the higheſt rocky mountains from the Altaic chain to that which divides Thibet from India; likewiſe in China and Tonquin, and in eaſtern Siberia about lake Baikal and the rivers Jeniſea and Argun. It avoids mankind, dwelling ſolitarily in the moſt precipitous places of the mountains, among rocks in the ſmall narrow valleys ſurrounded by theſe ſnowy hills, and the pine foreſts which grow in their interſtices. It is a very gentle and timid animal, excepting in rutting time, when the males fight violently with their tuſks for the females; it is exceedingly active in leaping, running, climbing, and ſwimming, and is very difficultly tamed; the fleſh is eatable, and that of the younger animals is reckoned delicate. The

chace of them is a trade equally difficult and hazardous; if purſued, they ſeek the higheſt tops of the ſnowy peaks, inacceſſible to men or dogs. They take amazing leaps over the tremendous chaſms of the alps, or from rock to rock; treading ſo light on the ſnow with their true and falſe hoofs extended, as ſcarcely to leave a mark; while the dogs which purſue them ſink in, and are forced to deſiſt from the chaſe. They are ſo fond of liberty as never to be kept alive in captivity. They are moſtly taken in ſnares, or ſhot by croſsbows placed in their tracks, with a ſtring from the trigger for them to tread on, and diſcharge. The Tunguſi ſhoot them with bows and arrows. The ſkins are uſed for bonnets and winter dreſſes. The Ruſſians often ſcrape off the hair, and have a way of preparing them for ſummer cloathing, ſo as to become as ſoft and ſhining as ſilk. The noted drug the muſk is produced from the male. The bag or follicle that contains it is ſituated near the prepuce; and is of a ſomewhat oval figure, flat on one ſide and rounded on the other, having a ſmall open orifice. In young animals this bag is empty; but in adults it is filled with a clotted, oily, friable matter, of a dark brown colour: this is the true muſk, of which each bag contains from a dram and a half to two drams. The beſt comes from Thibet; that which is produced in Siberia having ſomewhat of the flavour of caſtor.

2. The Americanus, or Braſilian muſk, of a reddiſh brown colour, with a black muzzle and white throat, is ſcarcely ſo large as a roe-buck. The fur is ſoft and ſhort; the colour of the head and upper part of the neck is dark brown; the lower part of the neck and throat are white; the body and limbs are reddiſh brown; the hind legs are longer than the fore. This animal, which inhabits Guiana and Braſil, is exceedingly timid, active, and ſwift. Numbers are frequently ſeen ſwimming in the rivers, and at that time are eaſily taken. The Indians hunt them, and their fleſh is eſteemed very delicate. The French of Guiana call them *biches* or does, becauſe, notwithſtanding their likeneſs to deer, both ſexes are without horns. Gmelin ſuſpects this animal may only be a fawn of the American roe.

3. The Indicus, or Indian muſk, has ſhort hair of a tawney colour on the upper, and whitiſh on the under parts of the body; the tail is ſhort, and the feet have ſpurious hoofs. It inhabits India, and is much of the ſame ſize with the moſchiferus, but the tail is longer and more perceptible; the legs are very ſlender; and the head reſembles that of a horſe, with erect oblong ears.

4. The pigmæus, or pigmy muſk, is marked as to colour like the former, but has no ſpurious hoofs.—The body and head meaſure only nine inches and a half in length; the tail is about an inch long; and the legs are ſmaller than a man's finger. It inhabits the Eaſt Indies and ſeveral of the Indian iſlands. It is called *kant chel* by the Malayes, and *poet jang* by the inhabitants of Java. The natives catch them in great numbers, carry them in cages to market, and ſell them for 2½ d. a piece.

5. The meminna, or Ceylon chevrotin, is in length 17 inches from the noſe to the rump, and of a cinereous olive colour; the throat, breaſt, and belly, are white; the ſides and haunches ſpotted, and barred tranſverſely with white; and the ears are large and open: the tail is very ſhort; and the feet have no ſpurious hoofs. It inhabits Ceylon and Java.

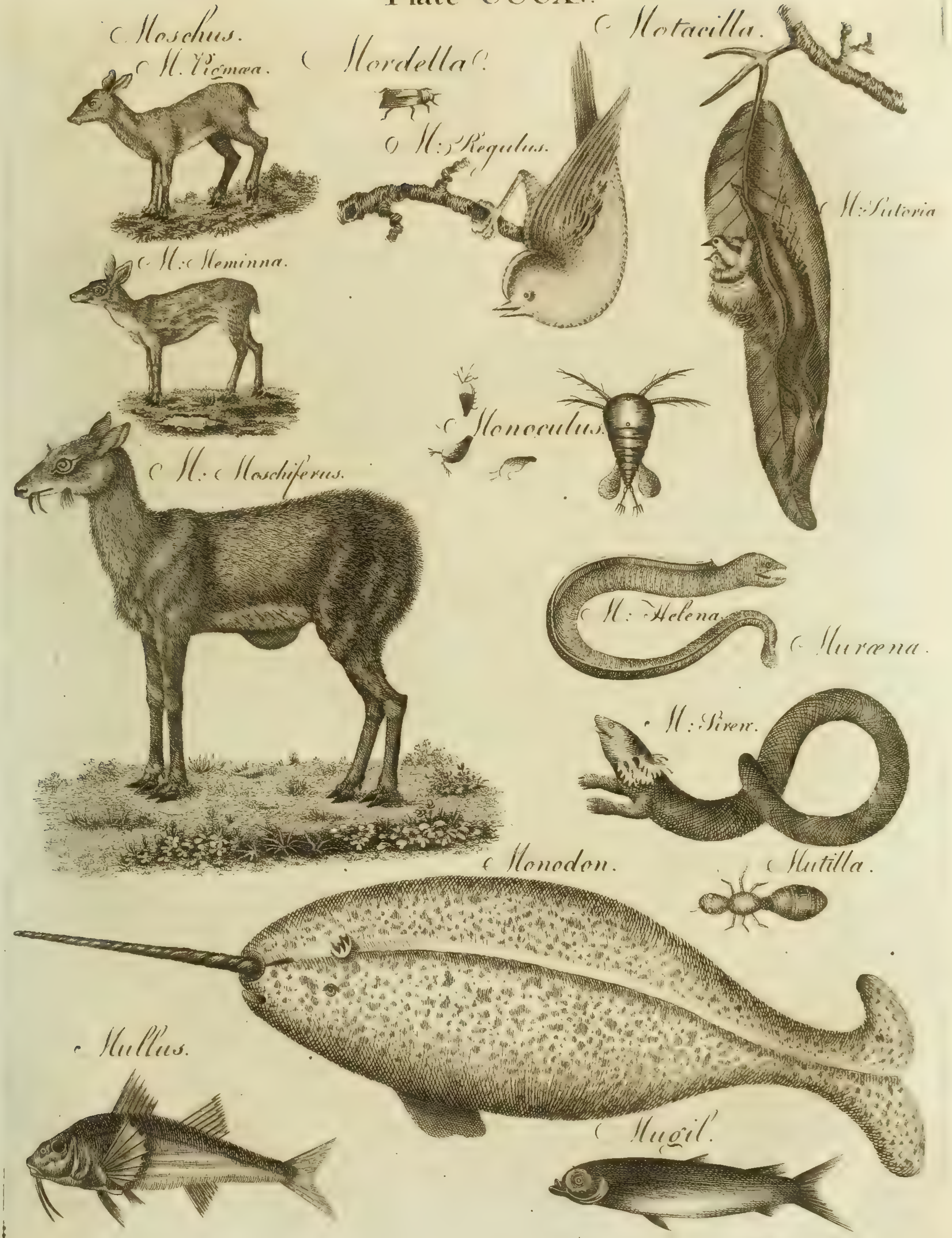
6. The javanicus, or Javan muſk, is of a ferruginous colour on the upper parts of the body, and white all along the under; the tail is long and hairy, white below and at the tip; its legs are ſimilar to thoſe of the pigmy muſk, and furniſhed with very ſmall ſpurious hoofs. This and the meminna ſeem only varieties of the pigmæus.

MOSCOW, the chief province of the empire of Ruſſia, deriving its name from the river Muſcova, or Moſkva, on which the capital is ſituated. It was from this duchy that the czars of old took the title of *dukes of Muſcovy*. The province is bounded on the north by the duchies of Twere, Roſtow, Suſdal, and Wolodimer; on the ſouth by Rezan, from which it is ſeparated by the river Occa; on the eaſt by the principality of Cachine, and the ſame river Occa parting it from Niſi Novogorod; and on the weſt by the duchies of Rzeva, Biela, and Smolenſko. It extends about 200 miles in length, and about 100 in breadth; and is watered by the Moſka, Occa, and Cleſma, which fall into the Wolga: nevertheleſs, the ſoil is not very fertile. The air, however, though ſharp is ſalubrious; and this conſideration, with the advantage of its being ſituated in the midſt of the beſt provinces in the empire, induced the czars to make it their chief reſidence. In the weſtern part of Moſcow is a large foreſt, from whence flows the celebrated river Nieper, or Boryſthenes, which, traverſing the duchy of Smolenſko, winds in a ſerpentine courſe to Ukraine, Lithuania, and Poland.

Moscow, the capital of the above province, and till the beginning of the preſent century the metropolis of all Ruſſia, is ſituated in a ſpacious plain on the banks of the river Muſkova. The Ruſſian antiquaries differ conſiderably in their opinions concerning the firſt foundation of Moſcow; the following relation, Mr Coxe ſays, is generally eſteemed by the beſt authors the moſt probable account.

Kiof was the metropolis, when George ſon of Vladimir Monomaka aſcended in 1154 the Ruſſian throne. That monarch, being inſulted in a progreſs through his dominions by a rich and powerful nobleman named Stephen Kutchko, put him to death, and confiſcated his domains, which conſiſted of the lands now occupied by the city of Moſcow and the adjacent territory. Pleaſed with the ſituation of the ground lying at the conflux of the Moſkva and Neglina, he laid the foundation of a new town, which he called Moſkva from the river of that name. Upon the demiſe of George, the new town was not neglected by his ſon Andrew, who transferred the ſeat of empire from Kiof to Vladimir; but it fell into ſuch decay under his immediate ſucceſſors, that when Daniel, ſon of Alexander Nevſki, received, in the diviſion of the empire, the duchy of Muſcovy as his portion, and fixed his reſidence upon the conflux of the Moſkva and Neglina, he may be ſaid to have new founded the town. The ſpot now occupied by the Kremlin was at that time overſpread with a thick wood and a moraſs, in the midſt whereof was a ſmall iſland containing a ſingle wooden hut. Upon this part Daniel conſtructed churches and monaſteries, and various buildings, and encloſed

Plate CCCXV



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encloſed it with wooden fortifications; he firſt aſſumed the title of duke of Moſcow, and was ſo attached to this ſituation, that when in 1304 he ſucceeded his brother Andrew Alexandrovich in the great duchy of Vladimir, he did not remove his court to Vladimir, but continued his reſidence at Moſcow, which then became the capital of the Ruſſian dominions. His ſucceſſors followed his example; among whom his ſon Ivan conſiderably enlarged the new metropolis, and in 1367 his grandſon Demetrius Ivanovitch Donſki ſurrounded the Kremlin with a brick wall. Theſe new fortifications, however, were not ſtrong enough to prevent Tamerlane in 1382 from taking the town, after a ſhort ſiege. Being ſoon evacuated by that deſultory conqueror, it again came into the poſſeſſion of the Ruſſians; but was frequently invaded and occupied by the Tartars, who in the 14th and 15th centuries over-ran the greateſt part of Ruſſia, and who even maintained a garriſon in Moſcow until they were finally expelled for Ivan Vaſſilievitch I. To him Moſcow is indebted for its principal ſplendor, and under him it became the principal and moſt conſiderable city of the Ruſſian empire.

Moſcow continued the metropolis of Ruſſia until the beginning of the preſent century, when, to the great diſſatisfaction of the nobility, but with great advantage probably to the ſtate, the ſeat of empire, was transferred to Peterſburgh.

Notwithſtanding the predilection which Peter conceived for Peterſburgh, in which all the ſucceeding, ſovereigns excepting Peter II. have fixed their reſidence, Moſcow, according to Mr Coxe, is ſtill the moſt populous city of the Ruſſian empire. Here the chief nobles who do not belong to the court of the empreſs reſide: they here ſupport a larger number of retainers; they love to gratify their taſte for a ruder and more expenſive magnificence in the ancient ſtyle of feudal grandeur; and are not, as at Peterſburgh, eclipſed by the ſuperior ſplendor of the court.

Moſcow is repreſented as the largeſt town in Europe; its circumference within the rampart, which encloſes the ſuburbs, being exactly 39 verſts or 26 miles; but it is built in ſo ſtraggling and disjointed a manner, that its population in no degree correſponds to its extent. Some Ruſſian authors ſtate its inhabitants at 500,000 ſouls, a number evidently exaggerated. According to a late computation, which Mr Coxe ſays may be depended upon, Moſcow contains within the ramparts 250,000 ſouls, and in the adjacent villages 50,000. The ſtreets of Moſcow are in general exceedingly long and broad: ſome of them are paved; others, particularly thoſe in the ſuburbs, are formed with trunks of trees, or are boarded with planks like the floor of a room; wretched hovels are blended with large palaces; cottages of one ſtory ſtand next to the moſt ſuperb and ſtately manſions. Many brick ſtructures are covered with wooden tops; ſome of the wooden houſes are painted; others have iron doors and roofs. Numerous churches preſent themſelves in every quarter, built in a peculiar ſtyle of architecture; ſome with domes of copper, others of tin, gilt or painted green, and many roofed with wood. In a word, ſome parts of this vaſt city have the look of a ſequeſtered deſart, other quarters of a populous town; ſome of a contemptible village, others of a great capital.

Moſcow may be conſidered as a town built upon the Aſiatic model, but gradually becoming more and more European, and exhibiting in its preſent ſtate a motley mixture of diſcordant architecture. It is diſtributed into the following diviſions. 1. The Kremlin. This ſtands in the central and higheſt part of the city; is of a triangular form, and about two miles in circumference; and is ſurrounded by high walls of ſtone and brick, which were conſtructed in the year 1491, under the reign of Ivan Vaſſilievitch I. It contains the ancient palace of the czars, ſeveral churches, two convents, the patriarchal palace, the arſenal now in ruins, and one private houſe, which belonged to Boris Godunof before he was raiſed to the throne. 2. Khitaigorod, or the Chineſe town, is incloſed on one ſide by that wall of the Kremlin which runs from the Moſkva to the Neglina; and on the other ſide by a brick wall of inferior height. It is much larger than the Kremlin, and contains the univerſity, the printing-houſe, and many other public buildings, and all the tradeſmens ſhops. The edifices are moſtly ſtuccoed or white waſhed, and it has the only ſtreet in Moſcow in which the houſes ſtand cloſe to one another without any intervals between them. 3. The Bielgorod, or White Town, which runs quite round the two preceding diviſions, is ſuppoſed to derive its name from a white wall with which it was formerly encloſed, and of which ſome remains are ſtill to be ſeen. 4. Semlainogorod, which environs all the three other quarters, takes its denomination from a circular rampart of earth with which it is encompaſſed. Theſe two laſt mentioned diviſions exhibit a groteſque groupe of churches, convents, palaces, brick and wooden houſes, and mean hovels; in no degree ſuperior to peaſants cottages. 5. The Sloboda, or ſuburbs, form a vaſt exterior circle round all the parts already deſcribed, and are inveſted with a low rampart and ditch. Theſe ſuburbs contain, beſide buildings of all kinds and denominations, corn fields, much oxen paſture, and ſome ſmall lakes, which give riſe to the Neglina. The river *Moſkva*, from which the city takes its name, flows through it in a winding channel; but, excepting, in ſpring, is only navigable for rafts. It receives the Yauſa in the Semlainogorod, and the Neglina at the weſtern extremity of the Kremlin; the beds of both theſe laſt-mentioned rivulets are in ſummer little better than dry channels.

The places of divine worſhip at Moſcow are exceedingly numerous; including chapels, they amount to above 1000; there are 484 public churches, of which 199 are of brick, and the others of wood; the former are commonly ſtuccoed or white-waſhed, the latter painted of a red colour, The moſt ancient churches of Moſcow are generally ſquare buildings, with a cupola and four ſmall domes, ſome whereof are of copper or iron gilt; others of tin; either plain or painted green. Theſe cupolas and domes for the moſt part ornamented with croſſes entwined with thin chains or wires. The church of the Holy Trinity ſometimes called the church of Jeruſalem, which ſtands in the Khitaigorod, cloſe to the gate leading into the Kremlin, has a kind of high ſteeple and nine or ten

Moſcow.

Moſcow.

domes: it was built in the reign of Ivan Vaſſilievitch II. The inſide of the churches is moſtly compoſed of three parts: that called by the Greeks πρόναος, by the Ruſſians trapeza; the body; and the ſanctuary or altar. Over the door of each church is the portrait of the ſaint to whom it is dedicated, to which the common people pay their homage as they paſs along by taking off their hats, croſſing themſelves and occaſionally touching the ground with their heads. The bells, which form no inconſiderable part of public worſhip in this country, as the length or ſhortneſs of their peals aſcertains the greater or leſſer ſanctity of the day, are hung in belfreys detached from the church: they do not ſwing like our bells; but are fixed immoveably to the beams, and are rung by a rope tied to the clapper and pulled ſideways. Some of theſe bells are of a ſtupendous ſize: one in the tower of St Ivan's church weighs 3551 Ruſſian pounds, or 127,836 Engliſh pounds. It has always been eſteemed a meritorious act of religion to preſent a church with bells: and the piety of the donor has been meaſured by their magnitude. According to this mode of eſtimation, Boris Godunof, who gave a bell of 288,000 pounds to the cathedral of Moſcow, was the moſt pious ſovereign of Ruſſia, until he was ſurpaſſed by the empreſs Anne, at whoſe expence a bell was caſt weighing 432,000 pounds, and which exceeded in bigneſs every bell in the known world. The height of this enormous bell is 19 feet, its circumference at the bottom 21 yards 11 inches; its greateſt thickneſs 23 inches. The beam to which this vaſt machine was faſtened being accidentally burnt, the bell fell down, and a fragment was broken off towards the bottom, which left an aperture large enough to admit two perſons a-breaſt without ſtopping.

The palace, inhabited by the ancient czars, ſtands at the extremity of the Kremlin, Part of this palace is old, and remains in the ſame ſtate in which it was built under Ivan Vaſſilievitch I. The remainder has been ſucceſſively added at different intervals without any plan, and in various ſtyles of architecture, which has produced a motley pile of building, remarkable for nothing but the incongruity of the ſeveral ſtructures. The top is thickly ſet, with numerous little gilded ſpires and globes; and a large portion of the front is decorated with the arms of all the provinces which compoſe the Ruſſian empire. The apartments are in general exceedingly ſmall, excepting one ſingle room called the council-chamber, in which the ancient czars uſed to give audience to foreign ambaſſadors, and which has been repeatedly deſcribed by ſeveral Engliſh travellers who viſited Moſcow before the imperial reſidence was transfered to Peterſburg. The room is large and vaulted, and has in the centre an enormous pillar of ſtone which ſupports the ceiling. In this palace Peter the Great came into the world, in the year 1672. In that part called the treaſury are repoſited the crown, jewels, and royal robes, uſed at the coronation of the ſovereign, beſides ſeveral curioſities relative to the hiſtory of the country. Of the great number of churches contained in this city, two in particular, namely, that of St Michael and that of the Aſſumption of the Virgin Mary, are remarkable; the one for being the place where the ſovereigns of Ruſſia were formerly interred, and the other where they are crowned. Theſe edifices, which are ſituated in the Kremlin, are both in the ſame ſtyle of architecture; and their exterior form, though modelled according to the ancient ſtyle of the country, is not abſolutely inelegant. In the cathedral of St Michael, which contains the tombs of the Ruſſian ſovereigns, the bodies are not, as with us, depoſited in vaults, or beneath the pavement, but are entombed in raiſed ſepulchres, moſtly of brick, in the ſhape of a coffin, and about two feet in height, When Mr Coxe viſited the cathedral, the moſt ancient were covered with palls of red cloth, others of red velvet, and that of Peter II. with gold tiſſue, bordered with ſilver fringe and ermine. Each tomb has at its lower extremity a ſmall ſilver plate, upon which is engraved the name of the deceaſed ſovereign, and the æra of his death.

The cathedral of the Aſſumption of the Virgin Mary, which has long been appropriated to the coronation of the Ruſſian ſovereigns, is the moſt ſplendid and magnificent in Moſcow. The ſcreen is in many parts covered with plates of ſolid ſilver and gold richly worked. From the centre of the roof hangs an enormous chandelier of maſſy ſilver, weighing 2940 pounds; it was made in England, and was a preſent from Moroſof, prime miniſter and favourite of Alexey Michaelovitch. The ſacred utenſils and epiſcopal veſtments are extraordinarily rich, but the taſte of the workmanſhip is in general rude, and by no means equal to the materials. Many of the paintings which cover the inſide walls are of a Coloſſal ſize: ſome are very ancient, and were executed ſo early as in the latter end of the 15th century. It contains, amongſt the reſt, a head of the virgin, ſuppoſed to have been delineated by St Luke, and greatly celebrated in this country for its ſanctity and the power of working miracles. Its face is almoſt black; its head is ornamented with a glory of precious ſtones and its hands and body are gilded, which gives it a moſt groteſque appearance. It is placed in the ſkreen, and encloſed within a large ſilver covering, which is only taken off on great feſtivals, or for the curioſity of ſtangers. In this cathedral are depoſited the remains of the Ruſſian patriarchs.

The place in the Khitaigorod, where the public archives are depoſited, is a ſtrong brick building, containing ſeveral vaulted apartments with iron floors. Theſe archives conſiſting of a numerous collection of ſtate-papers, were crowded into boxes, and thrown aſide like common lumber, until the preſent empreſs ordered them to be reviſed and arranged. In conformity to this mandate, Mr Muller has diſpoſed them in chronological order with ſuch perfect regularity, than any ſingle document may be inſpected with little trouble. They are encloſed in ſeparate cabinets with glaſs doors; thoſe relative to Ruſſia are all claſſed according to the ſeveral provinces which they concern; and over each cabinet is inſcribed the name of the province to which it is appropriated. In the ſame manner the manuſcripts relative to foreign kingdoms are placed in ſeparate diviſions under the reſpective titles of Poland, Sweden, England, France, Germany, &c.

The univerſity of Moſcow, alſo ſituated in the Khitaigorod, was founded, at the inſtance of Count Shuvalof, by the empreſs Elizabeth, for 600 ſtudents; who are clothed, Moſcow.

clothed, boarded, and inſtructed, at the expence of the crown. Beſides this inſtitution, there are two gymnaſia or ſeminaries for the education of youth, endowed alſo by Elizabeth; in which are taught, by twenty-three philoſophers, divinity, claſſics, philoſophy, the Greek, Latin, Ruſſian, German, French, Italian, and Tartar languages; hiſtory, geography, mathematics, architecture, fortification, artillery, algebra, drawing and painting, muſic, fencing, dancing, reading and writing.

Moſcow is the centre of the inland commerce of Ruſſia, and particularly connects the trade between Europe and Siberia. The only navigation to this city is formed by the Moſkva, which falling into the Occa near Columna, communicates by means of that river with the Volga. But as the Moſkva is only navigable in ſpring upon the melting of the ſnows, the principal merchandiſe is conveyed to and from Moſcow upon ſledges in winter. As to the retail commerce here, the whole of it is carried on in the Khitaigorod; where, according to a cuſtom common in Ruſſia, as well as in moſt kingdoms of the Eaſt, all the ſhops are collected together in one ſpot. The place is like a kind of fair, conſiſting of many rows of low brick buildings; the interval between them reſembling alleys. Theſe ſhops or booths occupy a conſiderable ſpace; they do not, as with us, make part of the houſes inhabited by the tradeſmen, but are quite detached from their dwellings, which for the moſt part are at ſome diſtance in another quarter of the town. The tradeſman comes to his ſhop in the morning, remains there all day, and returns home to his family in the afternoon. Every trade has its ſeparate department; and they who ſell the ſame goods have booths adjoining to each other. Furs and ſkins form the moſt conſiderable article of commerce in Moſcow; and the ſhops which vend thoſe commodities occupy ſeveral ſtreets.

Among the curioſities of Moſcow, the market for the ſale of houſes is not the leaſt remarkable. It is held in a large open ſpace in one of the ſuburbs; and exhibits a great variety of ready-made houſes, thickly ſtrewed upon the ground. The purchaſer who wants a dwelling, repairs to this ſpot, mentions the number of rooms he requires, examines the different timbers, which are regularly numbered, and bargains for that which ſuits him. The houſe is ſometimes paid for on the ſpot and taken away by the purchaſer; or ſometimes the vender contracts to tranſport and erect it upon the place where it is deſigned to ſtand. It may appear incredible to aſſert, that a dwelling may be thus bought, removed, raiſed, and inhabited, within the ſpace of a week; but we ſhall conceive it practicable by conſidering that theſe ready-made houſes are in general merely collections of trunks of trees tenanted and mortoiſed at each extremity into one another, ſo that nothing more is required than the labour of tranſporting and adjuſting them. But this ſummary mode of building is not always peculiar to the meaner hovels; as wooden ſtructures of very large dimenſions and handſome appearance are occaſionally formed in Ruſſia with an expedition almoſt inconceivable to the inhabitants of other countries. A remarkable inſtance of this diſpatch was diſplayed the laſt time the empreſs came to Moſcow. Her majeſty propoſed to reſide in the manſion of prince Galitzin, which is eſteemed the completeſt edifice in this city; but as it was not ſufficiently ſpacious for her reception, a temporary addition of wood, larger than the original houſe, and containing a magnificent ſuite of apartments, was begun and finiſhed within the ſpace of ſix weeks. This meteor-like fabric was ſo handſome and commodious, that the materials which were taken down at her majeſty's departure, were to be reconſtructed as a kind of imperial villa upon an eminence near the city. Mr Coxe mentions an admirable police in this city for preventing riots, or for ſtopping the concourſe of people in caſe of fires, which are very frequent and violent in thoſe parts, where the houſes are moſtly of wood, and the ſtreets are laid with timber. At the entrance of each ſtreet there is a chevaux-de frize gate, one end whereof turns upon a pivot, and the other rolls upon a wheel; near it is a centry-box in which a man is occaſionally ſtationed. In times of riot or fire the centinel ſhuts the gate, and all paſſage is immediately ſtopped.

Among the public inſtitutions of Moſcow, the moſt remarkable is the Foundling Hoſpital, endowed in 1764 by the preſent empreſs, and ſupported by voluntary contributions and legacies, and other charitable gifts. In order to encourage donations, her majeſty grants to all benefactors ſome valuable privileges, and a certain degree of rank in proportion to the extent of their liberality. Among the principal contributors muſt be mentioned a private merchant named *Dimidof*, a perſon of great wealth, who has expended in favour of this charity above L. 100,000 The hoſpital, which is ſituated in a very airy part of the town upon a gentle aſcent near the river Moſkva, is an immenſe pile of building of a quadrangular ſhape, part of which was only finiſhed when Mr Coxe (whoſe account we are tranſcribing) was at Moſcow. It contained, at that time, 3000 foundlings; and, when the whole is completed, will receive 8000. The children are brought to the porter's lodge, and admitted without any recommendation. The rooms are lofty and large; the dormitories, which are ſeparate from the work rooms, are very airy, and the beds are not crowded: each foundling, even each infant has a ſeparate bed; the beadſteads are of iron; the ſheets are changed every week, and the linen three times a-week. Through the whole rooms the greateſt neatneſs prevails; even the nurſeries being uncommonly clean, and without any unwholeſome ſmells. No cradles are allowed, and rocking is particularly forbidden. The infants are not ſwaddled according to the cuſtom of the country but looſely dreſſed.—The foundlings are divided into ſeparate claſſes, according to their reſpective ages. The children remain two years in the nurſery, when they are admitted into the loweſt claſs; the boys and girls continue together until they are ſeven years of age, at which time they are ſeparated. They all learn to read, write, and caſt accounts. The boys are taught to knit; they occaſionally card hemp, flax, and wool, and work in the different manufactures. The girls learn to knit, net, and all kinds of needle-work; they ſpin and weave lace; they are employed in cookery, baking, and houſe-work of all ſorts. At the age of 14 the foundlings enter into the firſt claſs; when they have the liberty of chooſing any particular branch of trade; and for this purpoſe there are different ſpecies of manufactures eſtabliſhed in the hoſpital, of which the principal are embroidery, ſilk ſtockings, ribbands, lace, gloves, buttons, and cabinet work. A ſeparate room is appropriated to each trade. Some boys and girls are inſtructed in the French and German languages, and a few boys in the Latin tongue; others learn muſic, drawing, and dancing. About the age of 20, the foundlings receive a ſum of money, and ſeveral advantages, which enable them to follow their trade in any part of the empire: a very conſiderable privilege in Ruſſia, where the peaſants are ſlaves, and cannot leave their village without the permiſſion of the maſter.— The girls and boys eat ſeparately. The dining rooms, which are upon the ground-floor are large and vaulted, and diſtinct from their work-rooms. The firſt claſs ſit at table: the reſt ſtand; the little children are attended by ſervants; but thoſe of the firſt or ſecond claſs alternately wait upon eachother. Their victuals are of the moſt wholeſome and nouriſhing kinds. Each foundling has a napkin, pewter plate, a knife, fork and ſpoon: the napkin and table-cloth are clean three times in the week. They riſe at ſix, dine at eleven, and ſup at ſix. The little children have bread at ſeven and at four. When they are not employed in their neceſſary occupations, the utmoſt freedom is allowed, and they are encouraged to be as much in the air as poſſible.

MOSELLE, a river of Germany, which riſes in the mountains of Vauge in Lorrain, and, running thro' that duchy and the electorate of Triers, falls into the Rhine at Coblentz.

MOSES, the ſon of Amram and Jochebed, was born in the year 1571 before chriſt. Pharaoh king of Egypt, perceiving that the Hebrews were become a formidable nation, iſſued forth an edict commanding all the male children to be put to death. Jochebed, the mother of Moſes, having, to avoid this cruel edict, concealed her ſon for three months, at length made an ark or baſket of bulruſhes, daubed it with pitch, laid the child in it, and expoſed him on the banks of the Nile. Thermuthis the king's daughter, who happened to be walking by the river's ſide, perceived the floating cradle, commanded it to be brought to her, and ſtruck with the beauty of the child, determined to preſerve his life. In three years afterwards the princeſs adopted him for her own ſon, called his name *Moſes*, and cauſed him to be diligently inſtructed in all the learning of the Egyptians. But his father and mother, to whom he was reſtored by a fortunate accident, were at ſtill greater pains to teach him the hiſtory and religion of his fathers. Many things are related by hiſtorians concerning the firſt period of Moſes's life, which are not to be found in the Old Teſtament. According to Joſephus and Euſebius, he made war on the Ethiopians, and completely defeated them. They add, that the city Saba, in which the enemy had been forced to take refuge, was betrayed into his hands by the king's daughter, who became deeply enamoured of him, when ſhe beheld from the top of the walls his valorous exploits at the head of the Egyptian army. But as the truth of this expedition is more than doubtful, we ſhall therefore confine ourſelves to the narrative of ſacred writ, which commences at the fortieth year of Moſes's life. He then left the court of Pharaoh, and went to viſit his countrymen the Hebrews, who groaned under the ill-uſage and oppreſſion of their unfeeling maſters. Having perceived an Egyptian ſmiting an Hebrew, he ſlew the Egyptian, and buried him in the ſand. But he was obliged, in conſequence of this murder, to fly into the land of Midian, where he married Zipporah, daughter of the prieſt Jethro, by whom he had two ſons, Gerſhom and Eliezar. Here he lived 40 years; during which time his employment was to tend the flocks of his father-in-law. Having one day led his flock towards Mount Horeb, God appeared to him in the midſt of a buſh which burned with fire but was not conſumed, and commanded him to go and deliver his brethren from their bondage. Moſes at firſt refuſed to go, but was at length prevailed on by two miracles which the Almighty wrought for his conviction. Upon his return to Egypt, he, together with his brother Aaron, went to the court of Pharaoh ,and told him that God commanded him to let the Hebrews go to offer ſacrifices in the deſert of Arabia. But the impious monarch diſregarded this command, and cauſed the labour of the Iſraelites to be doubled. The meſſengers of the Almighty again returned to the king, and wrought a miracle in his ſight, that they might move his heart, and induce him to let the people depart. Aaron having caſt down his miraculous rod, it was immediately converted into a ſerpent; but the ſame thing being performed by the magicians, the king's heart was hardened more and more; and his obſtinacy at laſt drew down the judgements of the Almighty on his kingdom, which was afflicted with ten dreadful plagues. The firſt was the changing of the waters of the Nile and of all the rivers into blood, ſo that the Egyptians died of thirſt. In conſequence of the ſecond plague, the land was covered with innumerable ſwarms of frogs, which entered even into Pharaoh's palace. By the third plague, the duſt was converted into lice, which cruelly tormented both man and beaſt. The fourth plague was a multitude of deſtructive flies which ſpread throughout Egypt, and infeſted the whole country. The fifth was a ſudden peſtilence, which deſtroyed all the cattle of the Egyptians, without injuring thoſe of the Iſraelites. The ſixth produced numberleſs ulcers and fiery biles upon man and upon beaſt. The ſeventh was a dreadful ſtorm of hail, accompanied with thunder and lightning, which deſtroyed every thing that was in the field, whether man or beaſt, and ſpared only the land of Goſhen where the children of Iſrael dwelt. By the eighth plague ſwarms of locuſts were brought into the country, which devoured every green herb, the fruit of the trees and the produce of the harveſt. By the ninth plague thick darkneſs covered all the land of Egypt, except the dwellings of the children of Iſrael. The tenth and laſt plague was the death of the firſt-born in Egypt, who were all in one night cut off by the deſtroying angel, from the firſt-born of the king to the firſt-born of the ſlaves and of the cattle. This dreadful calamity moved the heart of the hardened Pharaoh, and he at length conſented to allow the people of Iſrael to depart from his kingdom.

Profane authors who have ſpoken of Moſes, ſeem to have been in part acquainted with theſe mighty wonders. That he performed miracles, muſt have been allowed by many, by whom he was conſidered as a famous magician; and he could ſcarcely appear in any other light to men who did not acknowledge him for the meſſenger of the Almighty. Both Diodorus and Herodotus mention the diſtreſſed ſtate to which Egypt was reduced by theſe terrible calamities. The Hebrews, amounting to the number of 600,000 men, without reckoning women and children, left Egypt on the 15th day of the month Niſan, which, in memory of this deliverance, was thenceforth reckoned the firſt month of their year. Scarcely had they reached the firſt ſhore of the Red Sea when Pharaoh with a powerful army ſet out in purſuit of them. On this occaſion Moſes ſtretched forth his rod upon the ſea; and the waters thereof being divided, remained ſuſpended on both ſides till the Hebrews paſſed through dry-footed. ---The Egyptians determined to follow the ſame courſe; but God cauſed a violent wind to blow, which brought back the waters to their bed, and the whole army of Pharoah periſhed in the waves.

After the miraculous paſſage of the Red Sea, the army proceeded towards Mount Sinai, and arrived at Marah, where the waters were bitter; but Moſes, by caſting a tree into them, rendered them fit for drinking. Their tenth encampment was at Rephidim; where Moſes drew water from the rock in Horeb, by ſmiting it with his rod. Here likewiſe Amalek attacked Iſrael. While Joſhua fought againſt the Amalekites, Moſes ſtood on the top of a hill, and lifted up his hand; in conſequence of which the Iſraelites prevailed and cut their enemies in pieces. They at length arrived at the foot of Mount Sinai on the third day of the ninth month after their departure from Egypt. Moſes having aſcended ſeveral times into the mount, received the law from the hand of God himſelf in the midſt of thunders and lightnings, and concluded the famous covenant betwixt the Lord and the children of Iſrael. When he deſcended from Sinai, he found that the people had fallen into the idolatrous worſhip of the golden calf. The meſſenger of God, ſhocked at ſuch ingratitude, broke in pieces the tables of the law which he carried in his hands, and put 23,000 of the tranſgreſſors to the ſword. He afterwards re-aſcended into the mountain, and there obtained new tables of ſtone on which the law was inſcribed. When Moſes deſcended, his face ſhone ſo that the Iſraelites dared not to come nigh unto him, and he was obliged to cover it with a veil. The Iſraelites were here employed in conſtructing the tabernacle according to a pattern ſhown them by God. It was erected and conſecrated at the foot of the Mount Sinai on the firſt day of the firſt month of the ſecond year after their departure from Egypt; and it ſerved the Iſraelites inſtead of a temple till the time of Solomon, who built a houſe for the God of his fathers after a model ſhown him by David.

Moſes having dedicated the tabernacle, he conſecrated Aaron and his ſons to be its miniſters, and appointed the Levites to its ſervice. He likewiſe gave various commandments concerning the worſhip of God and the political government of the Jews. This was a *theocracy* in the full extent of the word. God himſelf governed them immediately by means of his ſervant Moſes, whom he had choſen to be the interpreter of his will to the people; and he required all the honours belonging to their king to be paid unto himſelf. He dwelt in his tabernacle, which was ſituated in the middle of the camp, like a monarch in his palace. He gave anſwers to thoſe who conſulted him, and himſelf denounced puniſhments againſt the tranſgreſſors of his laws. This properly was the time of the theocracy, taken in its full extent; for God was not only conſidered as the divinity who was the object of their religious worſhip, but as the ſovereign to whom the honours of ſupreme majeſty were paid. The caſe was nearly the ſame under Joſhua; who, being filled with the ſpirit of Moſes, undertook nothing without conſulting God. Every meaſure, both of the leader and of the people, was regulated by the direction of the Almighty, who rewarded their fidelity and obedience by a ſeries of miracles, victories, and ſucceſſes. After Moſes had regulated every thing regarding the civil adminiſtration, and the marching of the troops, he led the Iſraelites to the confines of Canaan, to the foot of Mount Nebo. Here the Lord commanded him to aſcend into the mountain; whence he ſhowed him the promiſed land, whereinto he was not permitted to enter. He immediately after yielded up the ghoſt, without ſickneſs or pain, in the 120th year of his age, and 1451 years before Jeſus Chriſt.

Moſes is inconteſtably the author of the firſt five books of the Old Teſtament, which go by the name of the *Pentateuch*; and which are acknowledged to be inſpired, by the Jews and by Chriſtians of every perſuation. Some, however, have denied that Moſes was the author of theſe books; and have founded their opinion on this, that he always ſpeaks of himſelf in the third perſon. But this manner of writing is by no means peculiar to Moſes: it occurs alſo in ſeveral ancient hiſtorians; ſuch as Xenophon, Cæſar, Joſephus, &c. who, poſſeſſed of more modeſty or good ſenſe than ſome modern hiſtorians, whoſe egotiſm is altogether diſguſting, have not like them left to poſterity a ſpectacle of ridiculous vanity and ſelf conceit. After all it is proper to obſerve that profane authors have related many falſehoods and abſurdities concerning Moſes, and concerning the origin and the religion of the Jews, with which they were but little acquainted. Plutarch, in his book concerning Iſis and Oſiris, ſays, that Judæus and Hieroſolymus were brothers, and deſcended from Typhon; and that the former gave his name to the country and its inhabitants, and the latter to the capital city. Others ſay that they came from Mount Ida in Phrygia. Strabo is the only author who ſpeaks any thing like reaſon and truth concerning them; tho' he too ſays that they were deſcended from the Egyptians, and conſiders Moſes their legiſlator as an Egyptian prieſt. He acknowledges, however, that they were a people ſtrictly juſt and ſincerely religious. Other authors by whom they are mentioned, ſeem not to have had the ſmalleſt acquaintance either with their laws or their worſhip. They frequently confound them with the Chriſtians, as is the caſe with Juvenal, Tacitus, and Quintilian.

MOSHEIM (John Laurence), an illuſtrious German divine, was born in 1695, of a noble family, which might ſeem to open to his ambition a fair path to civil promotion; but his zeal for the intereſts of religion,

religion, his thirſt after knowledge, and particularly his taſte for ſacred literature, induced him to conſecrate his talents to the ſervice of the church. The German univerſities loaded him with literary honours; the king of Denmark invited him to ſettle at Copenhagen; the duke of Brunſwick called him thence to Helmſtadt, where he filled the academical chair of divinity; was honoured with the character of eccleſiaſtical counſellor to the court; and preſided over the ſeminaries of learning in the duchy of Wolfenbuttle and the principality of Blackenburgh. When a deſign was formed of giving an uncommon degree of luſtre to the univerſity of Gottingen, by filling it with men of the firſt rank in letters, Dr Moſheim was deemed worthy to appear at the head of it, in quality of chancellor: and here he died, univerſally lamented, in 1755. In depth of judgment, in extent of learning, in purity of taſte, in the powers of eloquence, and in a laborious application to all the various branches of erudition and philoſophy, he had certainly very few ſuperiors. His Latin tranſlation of Cudworth's Intellectual Syſtem, enriched with large annotations, diſcovered a profound acquaintance with ancient learning and philoſophy. His illuſtrations of the Scriptures, his labours in defence of Chriſtianity, and the light he caſt upon religion and philoſophy, appear in many volumes of ſacred and profane literature; and his Eccleſiaſtical Hiſtory, from the birth of Chriſt to the beginning of the preſent century, is unqueſtionably the beſt that is extant. This work, written in Latin, has been tranſlated into Engliſh, and accompanied with notes and chronological tables by Archibald Maclaine, D. D. and from this tranſlator's preface to the ſecond edition, 1758, in 5 vols 8vo, this ſhort account is taken.

MOSKITO-COUNTRY, is ſituated in North America, between 85 and 88 degrees of weſt longitude, and betwen 13 and 15 degrees of north latitudé; having the north ſea on the north and eaſt, Nicaragua on the ſouth, and Honduras on the weſt; and indeed the Spaniards eſteem it a part of the principality of Honduras, though they have no colonies in the Moſkito country. When the Spaniards firſt invaded this part of Mexico, they maſſacred the greateſt part of the natives, which gave thoſe that eſcaped into the inacceſſible part of the country an inſuperable averſion to them and they have always appeared ready to join any Europeans that come upon their coaſts againſt the Spaniards, and particularly the Engliſh, who frequently come hither; and the Moſkito men being excellent markſmen, the Engliſh employ them in ſtriking the maratee fiſh, &c. and many of the Moſkito Indians come to Jamaica, and ſail with the Engliſh in their voyages.

Theſe people are ſo ſituated between moraſſes and inacceſſible mountains, and a coaſt full of rocks and ſhoals, that no attempts againſt them by the Spaniards whom they mortally hate, could ever ſucceed. Nevertheleſs, they are a mild inoffenſive people, of great morality and virtue, and will never truſt a man who has once deceived them. They have ſo great a veneration towards the Engliſh, that they have ſpontaneouſly put themſelves and their lands under the protection and dominion of the crown of England. This was firſt done when the duke of Albemarle was governor of Jamaica, and the king of the Moſkitos received a commiſſion from his grace, under the ſeal of that iſland; ſince which time they have not only been ſteady in their alliance with the Engliſh, but warm in their affections, and very uſeful to them on many occaſions.

When their king dies, the male heir goes to Jamaica, to certify that he is next in blood, and receives a commiſſion in form from the governor of Jamaica to be king of the Moſkitos, till which he is not acknowledged as ſuch by his countrymen. So fond are theſe people of every thing that is Engliſh, that the common people are proud of every Chriſtian or ſurname given them by our ſeamen, who honour their chief men with the titles of ſome of our nobility.

MOSQUE, a temple or place of religious worſhip among the Mahometans.

All moſques are ſquare buildings, generally conſtructed of ſtone. Before the chief gate there is a ſquare court paved with white marble; and low galleries round it, whoſe roof is ſupported by marble pillars. In theſe galleries the Turks waſh themſelves before they go into the moſque. In each moſque there is a great number of lamps; and between theſe hang many cryſtal rings, oſtriches eggs, and other curioſities, which when the lamps are lighted, make a fine ſhow. As it is not lawful to enter the moſque with ſtockings or ſhoes on, the pavements are covered with pieces of ſtuff ſewed together, each being wide enough to hold a row of men kneeling, ſitting, or proſtrate. The women are not allowed to enter the moſque, but ſtay in the porches without. About every moſque there are ſix high towers, called *minarets*, each of which has three little open galleries one above another; theſe towers, as well as the moſques, are covered with lead, and adorned with gilding and other ornaments: and from thence, inſtead of a bell, the people are called to prayers by certain officers appointed for that purpoſe. Moſt of the moſques have a kind of hoſpital belonging to them, in which travellers of what religion ſoever are entertained three days. Each moſque has alſo a place called *tarbe*, which is the burying-place of its founders; within which is a tomb ſix or ſeven feet long, covered with green velvet or ſattin; at the ends of which are two tapers, and round it ſeveral ſeats for thoſe who read the koran and pray for the ſouls of the diſeaſed.

MOSS (Dr Robert), dean of Ely, was eldeſt ſon of Mr Robert Moſs, a gentleman in good circumſtances; and was born at Gillingham in Norfolk in 1666. He was bred at Bennet-college, Cambridge; and acquired great reputation both as a diſputant and a preacher. He became preacher to the ſociety of Gray's-inn, London, in 1698; and aſſiſtant preacher to Dr Wake at St James's, Weſtminſter, 1699. He was ſworn chaplain in three ſucceeding reigns, to King William, Queen Anne, and George I. and being one of the chaplains in waiting when Queen Anne viſited the univerſity of Cambridge, April 5, 1705, he was then created D. D. In 1708 he was invited by the pariſhoners of St Lawrence Jewry, on the reſignation of dean Stanhope, to accept of their Tueſday lecture, which he held till 1727, and then reſigned it on account

count of his growing infirmities. In 1712, on the death of Dr Roderick, he was nominated by the queen to the deanry of Ely, which was the higheſt, but not the laſt, promotion he obtained in the church; for in 1714 he was collated, by Robinſon biſhop of London, to Gliſton, a ſmall rectory on the eaſtern ſide of Hertfordſhire. The gout deprived him of the uſe of his limbs for ſome of the laſt years of his life; and he died March 26, 1729, in his 63d year, and was buried in the preſbytery of his own cathedral, under a plain ſtone with a ſimple inſcription. His character may be ſeen in the preface to the eight volumes of his Sermons, which has uſually been attributed to Dr Snape, the editor of the ſermons; but the credit of it has lately been transferred to Dr Zachary Grey. Dean Moſs is alſo ſuppoſed to have been the author of a pamphlet printed in 1717, intitled. "The report vindicated from miſreports: being a defence of my lords the biſhops, as well as the clergy of the lower houſe of convocation; in a letter from a member of that houſe to the prolocutor concerning their late conſultations about the biſhop of Bangor's writings." He wrote alſo ſome poems, both Latin and Engliſh.

MOSS, or MOSSES, in botany. See MUSCI.

Moſs on Trees, in gardening. The growth of large quantities of moſs on any kind of tree is a diſtemper of very bad conſequence to its increaſe, and much damages the fruit of the trees of our orchards.

The preſent remedy is the ſcraping it off from the body and large branches by means of a kind of wooden knife that will not hurt the bark, or with a piece of rough hair cloth, which does very well after a ſoaking rain. But the moſt effectual cure is the taking away the cauſe. This is to be done by draining off all the ſuperfluous moiſture from about the roots of the trees, and may greatly be guarded againſt in the firſt planting of the trees, by not ſetting them too deep.

If trees ſtand too thick in a cold ground, they will always be covered with moſs; and the beſt way to remedy the fault is to thin them. When the young branches of trees are covered with a long and ſhaggy moſs, it will utterly ruin them; and there is no way to prevent it but to cut off the branches near the trunk, and even to take off the head of the tree if neceſſary; for it will ſprout again: and if the cauſe be in the mean time removed by thinning the plantation, or draining the land and ſtirring the ground well, the young ſhoots will continue clear after this.

If the trees are covered with moſs in conſequence of the ground's being too dry, as this will happen from either extreme in the ſoil, then the proper remedy is the laying mud from the bottom of a pond or river pretty thick about the root, opening the ground to ſome diſtance and depth to let it in; this will not only cool it, and prevent its giving growth to any great quantity of moſs, but it will alſo prevent the other great miſchief which fruit-trees are liable to in dry grounds, which is the falling off of the fruit too early.

The moſſes which cover the trunks of trees, as they always are freſheſt and moſt vigorous on the ſide which points to the north, if only produced on that, ſerve to preſerve the trunk of the tree from the ſeverity of the north-winds, and direct the traveller in his way, by always plainly pointing out that part of the compaſs.

MOSS is alſo a name given by ſome to the boggy ground in many parts of England, otherwiſe called a *fen* and *bog*.

In many of theſe grounds, as well in England and Ireland as in other parts of the world, there are found vaſt numbers of trees ſtanding with their ſtumps erect, and their roots piercing the ground in a natural poſture as when growing. Many of thoſe trees are broken or cut off near the roots, and lie along, and this uſually in a north-eaſt direction. People who have been willing to account for this, have uſually reſolved it into the effect of the deluge in the days of Noah; but this is a very wild conjecture, and is proved falſe by many unanſwerable arguments. The waters of this deluge might indeed have waſhed together a great number of trees, and buried them under loads of earth; but then they would have lain irregularly and at random; whereas they all lie lengthwiſe from ſouth-weſt to north-eaſt, and the roots all ſtand in their natural perpendicular poſture, as cloſe as the roots of trees in a foreſt.

Beſide, theſe trees are not all in their natural ſtate, but many of them have the evident marks of human workmanſhip upon them, ſome being cut down with an ax, ſome ſplit, and the wedges ſtill remaining in them; ſome burnt in different parts, and ſome bored through with holes. Theſe things are alſo proved to be of a later date than the deluge, by other matters found among them, ſuch as utenſils of ancient people, and coins of the Roman emperors.

It appears from the whole, that all the trees which we find in this foſſile ſtate, originally grew in the very places where we now find them, and have only been thrown down and buried there, not brought from elſewhere. It may appear indeed an objection to this opinion, that moſt of theſe foſſile trees are of the fir-kind; and that Cæſar ſays expreſsly, that no firs grew in Britain in his time: but this is eaſily anſwered by obſerving, that theſe trees, though of the fir-kind, yet are not the ſpecies uſually called the *fir*, but pitch-tree; and Cæſar has no where ſaid that pitch-trees did not grow in England. Norway and Sweden yet abound with theſe trees; and there are at this time whole foreſts of them in many parts of Scotland, and a large number of them wild upon a hill at Wareton in Staffordſhire to this day.

In Hatfield marſh, where ſuch vaſt numbers of the foſſile trees are now found, there has evidently once been a whole foreſt of them growing. The laſt of theſe was found alive, and growing in that place within 70 years laſt paſt, and cut down for ſome common uſe.

It is alſo objected by ſome to the ſyſtem of the firs growing where they are found foſſile, that theſe countries are all bogs and moors, whereas theſe ſorts of trees grow only in mountainous places. But this is founded on an error; for though in Norway and Sweden, and ſome other cold countries, the fir kinds all grow upon barren and dry rocky mountains, yet in warmer places they are found to thrive as well on wet plains. Such are found plentifully in Pomerania, Livonia, and Courland, &c. and in the weſt parts of New

England there are vaſt numbers of fine ſtately trees of them in low grounds. The whole truth ſeems to be, that theſe trees love a ſandy ſoil; and ſuch as is found at the bottoms of all the moſſes where theſe trees are found foſſile. The roots of the fir-kind are always found fixed in theſe; and thoſe of oaks, where they are found foſſile in this manner are uſually found fixed in clay: ſo that each kind of tree is always found rooted in the places where they ſtand in their proper ſoil; and there is no doubt to be made but that they originally grew there. When we have thus found that all the foſſile trees we meet with once grew in the places where they are now buried, it is plain that in theſe places there were once noble foreſts, which have been deſtroyed at ſome time; and the queſtion only remains how and by whom they were deſtroyed. This we have reaſon to believe, by the Roman coins found among them, was done by the people of that empire, and that at the time when they were eſtabliſhed or eſtabliſhing themſelves there.

Their own hiſtorian tells us, that when their armies purſued the wild Britons, theſe people always ſheltered themſelves in the miry woods and low watery foreſts. Cæſar expreſsly ſays this; and obſerves, that Caſſibelan and his Britons, after their defeat, paſſed the Thames, and fled into ſuch low moraſſes and woods, that there was no purſuing them: and we find that the Silures ſecured themſelves in the ſame manner when attacked by Oſtorius and Agricola. The ſame thing is recorded of Venutius king of the Brigantes, who fled to ſecure himſelf into the boggy foreſts of the midland part of this kingdom: and Herodian expreſsly, ſays, that in the time of the Romans puſhing their conqueſts in theſe iſlands, it was the cuſtom of the Britons to ſecure themſelves in the thick foreſts which grew in their boggy and wet places, and when opportunity offered, to iſſue out thence and fall upon the Romans. The conſequence of all this was the deſtroying of all theſe foreſts; the Romans finding themſelves ſo plagued with parties of the natives iſſuing out upon them at times from theſe foreſts, that they gave orders for the cutting down and deſtroying all the foreſts in Britain which grew on boggy and wet grounds. Theſe orders were punctually executed; and to this it is owing that at this day we can hardly be brought to believe that ſuch foreſts ever grew with us as are now found buried.

The Roman hiſtories all join in telling us, that when Suetonius Paulinus conquered Angleſea, he ordered all the woods to be cut down there, in the manner of the Roman generals in England; and Galen tells us, that the Romans, after their conqueſt in Britain, kept the ſoldiers conſtantly employed in cutting down foreſts, draining of marſhes, and paving of bogs. Not only the Roman ſoldiers were employed in this manner, but all the native Britons made captives in the wars were obliged to aſſiſt in it: and Dion Caſſius tells us, that the emperor Severus loſt no leſs than 50,000 men in a few years time in cutting down the woods and draining the bogs of this iſland. It is not to be wondered at, that ſuch numbers executed the immenſe deſtruction which we find in theſe buried foreſts. One of the greateſt ſubterranean treaſures of wood is that near Hatfield; and it is eaſy to prove, that theſe people, to whom this havock is thus attributed, were upon the ſpot where theſe trees now lie buried. The common road of the Romans out of the ſouth into the north, was formerly from Lindum (Lincoln), to Segelochum (little Burrow upon Trent), and from thence to Danum (Doncaſter), where they kept a ſtanding garriſon of Criſpinian horſe. A little off on the eaſt, and north-eaſt of their road, between the two laſt named towns, lay the borders of the greateſt foreſt, which ſwarmed with wild Britons, who were continually making their ſallies out, and their retreats into it again, intercepting their proviſions, taking and deſtroying their carriages, killing their allies and paſſengers, and diſturbing their garriſons. This at length ſo exaſperated the Romans, that they were determined to deſtroy it; and to do this ſafely and effectually, they marched againſt it with a great army, and encamped on a great moor not far from Finningly: this is evident from their fortifications yet remaining.

There is a ſmall town in the neighbourhood called *Oſterfield*; and as the termination *field* ſeems to have been given only in remembrance of battles fought near the towns whoſe names ended with it, it is not improbable that a battle was fought here between all the Britons who inhabited this foreſt and the Roman troops under Oſtorius. The Romans ſlew many of the Britons, and drove the reſt back into this foreſt, which at that time overſpread all this low country. On this the conquerors taking advantage of a ſtrong ſouth-weſt wind, ſet fire to the pitch-trees, of which this foreſt was principally compoſed; and when the greater part of the trees were thus deſtroyed, the Roman ſoldiers and captive Britons cut down the remainder, except a few large ones which they left ſtanding as remembrances of the deſtruction of the reſt. Theſe ſingle trees, however, could not ſtand long againſt the winds, and theſe falling into the rivers which ran through the country, interrupted their currents; and the water then overſpreading the level country, made one great lake, and gave origin to the moſſes or moory bogs, which were afterwards formed there, by the workings of the waters, the precipitation of earthy matter from them, and the putrefaction of rotten boughs and branches of trees, and the vaſt increaſe of water-moſs and other ſuch plants which grow in prodigious abundance in all theſe ſorts of places. Thus were theſe burnt and felled trees buried under a new-formed ſpongy and watery earth, and afterwards found on the draining and digging through this earth again.

Hence it is not ſtrange that Roman weapons and Roman coins are found among theſe buried trees; and hence it is that among the buried trees ſome are found burnt, ſome chopped and hewn; and hence it is that the bodies of the trees all lie by their proper roots, and with their tops lying north eaſt, that is, in that direction in which a ſouth-weſt wind would have blown them down: hence alſo it is, that ſome of the trees are found with their roots lying flat, theſe being not cut or burned down, but blown up by the roots afterwards when left ſingle; and it is not wonderful, that ſuch trees as theſe ſhould have continued to grow even after their fall, and ſhoot up branches from their ſides which might eaſily grow into high trees. Phil. Tranſ. N° 275.

By this ſyſtem it is alſo eaſily explained why the moor ſoil in the country is in ſome places two or three yards thicker than in others, or higher than it was formerly, ſince the growing up of peat-earth or bog-ground is well known, and the ſoil added by overflowing of waters is not a little.

As the Romans were the deſtroyers of this great and noble foreſt, ſo they were probably alſo of the ſeveral other ancient foreſts; the ruins of which furniſhes us with the bog-wood of Staffordſhire, Lancaſhire, Yorkſhire, and other counties. But as the Romans were not much in Wales, in the Iſle of Man, or in Ireland, it is not to be ſuppoſed that foreſts cut down by theſe people gave orign to the foſſile wood found there; but though they did not cut down theſe foreſts, others did: and the origin of the bog-wood is the ſame with them and with us. Holingſhead informs us, that Edward I. being not able to get at the Welch becauſe of their hiding themſelves in boggy woods, gave orders at length that they ſhould all be deſtroyed by fire and by the axe; and doubtleſs the roots and bodies of trees found in Pembrokeſhire under ground, are the remains of the execution of this order. The foſſile wood in the bogs of the iſland of Man is doubtleſs of the ſame origin, though we have not any accounts extant of the time or occaſion of the foreſts there being deſtroyed; but as to the foſſile trees of the bogs of Ireland, we are expreſsly told, that Henry II. when he conquered that country, ordered all the woods to be cut down that grew in the low parts of it, to, ſecure his conqueſts by cutting away the places of reſort of rebels.

Moving-MOSS. We have an account in the Philoſophical Tranſactions of a moving moſs near Churchtown in Lancaſhire, which greatly alarmed the neighbourhood as miraculous. The moſs was obſerved to riſe to a ſurpriſing height, and ſoon after ſunk as much below the level, and moved ſlowly towards the ſouth.

A very ſurpriſing inſtance of a moving moſs is that of Solway in Scotland, which happened in the year 1771, after ſevere rains which had produced terrible inundations of the rivers in many places. For the better underſtanding this event, we ſhall give the following deſcription of the ſpot of ground where it happened. Along the ſide of the river Eſk there is a vale, about a mile broad, leſs or more in different places. It is bounded on the ſouth-eaſt by the river Eſk, and on the north-weſt by a ſteep bank 30 feet in height above the level of the vale. From the top of the bank the ground riſes in an eaſy aſcent for about a quarter of a mile, where it is terminated by the moſs; which extends about two miles north and ſouth, and about a mile and an half eaſt and weſt, and is bounded on the north-weſt by the river Sark. It is probable that the ſolid ground from the top of the bank above the vale was continued in the ſame direction under the moſs, before its eruption, for a conſiderable ſpace: for the moſs at the place where the eruption happened, was inclined towards the ſloping ground. From the edge of the moſs there was a gully or hollow, called by the country people *the gap*, and ſaid to be 30 yards deep where it entered the vale; down which ran a ſmall rill of water which was often dry in ſummer, having no ſupply but what filtered from the moſs. The eruption happened at the head of this gap, on Saturday November 16th 1771, about ten or eleven at night, when all the neighbouring rivers and brooks were prodigiouſly ſwelled by the rains. A large body of the moſs was forced, partly by the great fall of rain, and partly by ſome ſprings below it, into a ſmall beck or burn, which runs within a few yards of its border to the ſouth-eaſt. By the united preſſure of the water behind it, and of this beck, which was then very high, it was carried down a narrow glen between two banks about 300 feet high, into a wide and ſpacious plain, over part of which it ſpread with great rapidity. The moſs continued for ſome time to ſend off conſiderable quantities; which, being borne along by the torrent on the back of the firſt great body, kept it for many hours in perpetual motion, and drove it ſtill farther on. This night at leaſt 400 acres of fine arable land were covered with moſs from 3 to 12 or 15 feet deep. Several houſes were deſtroyed, a good deal of corn loſt, &c. but all the inhabitants eſcaped. When the waters ſubſided, the moſs alſo ceaſed to flow; but two pretty conſiderable ſtreams continued to run from the heart of it, and carried off ſome pieces of moſſy matter to the place where it burſt. There they joined to the beck already mentioned; which, with this addition, reſumed its former channel; and, with a little aſſiſtance from the people of the neighbourhood, made its way to the Eſk, through the midſt of that great body of moſs which obſtructed its courſe. Thus, in a great meaſure drained, the new moſs fell ſeveral feet, when the fair weather came in the end of November, and ſettled in a firmer and more ſolid body on the lands it had over-run. By this inundation about 800 acres of arable ground were overflowed before the moſs ſtopped, and the habitations of 27 families deſtroyed. Tradition has preſerved the memory of a ſimilar inundation in Monteith in Scotland. A moſs there altered its courſe in one night, and covered a great extent of ground.

MOSS *of* Kincardine: A remarkable tract of ground in the ſhire of Perth in Scotland, which deſerves particular notice, not merely as a topographical curioſity, or as a ſubject of natural hiſtory; but for the information, equally uncommon and important, which it affords, reſpecting agricultural improvement, and the promotion of induſtry and population.

The moſs of Kincardine is ſituated in the pariſh of the ſame name, comprehended between the rivers Forth and Teith, and in that diſtrict of Perthſhire called *Monteith*. The moſs begins about a mile above the confluence of theſe rivers; from thence it extends in length about four miles, and from one to two in breadth; and before the commencement of the operations (an account of which is to be given), comprehend near 2000 Scotch acres, of which about 1500 belong to the eſtate of Blair Drummond, the property of Lord Kames by his marriage with Mrs Drummond of Blair Drummond.

As moſſes are extremely various in their nature; before entering upon the improvements made in Kircardine moſs, it will be proper to give a ſhort deſcription of that moſs, and of the ſubjacent ſoil which is the object of thoſe improvements.

The moſs lies upon a field of clay, which is a continuation of thoſe rich, extenſive flats in the neighbourhood of Falkirk and Stirling, diſtinguiſhed by the name of *carſes*. This clay, which is one uniform homogeneous maſs ſinking to a great depth, is found near the ſurface, conſiſts of different colours, and is diſpoſed in layers. The uppermoſt is grey; the next is reddiſh; and the loweſt, which is the moſt fertile, is blue. Through the whole maſs not a pebble is to be found. The only extraneous bodies it contains are ſea-ſhells, which occur in all the varieties peculiar to the eaſtern coaſt of Scotland. They are diſpoſed ſometimes in beds, ſometimes ſcattered irregularly at different depths. By attending to theſe circumſtances, it cannot be doubted that the ſea has been the means of the whole accumulation, and that it was carried on in a gradual manner by the ordinary ebb and flow of the tide. Upon any other ſuppoſition, why ſhould there not have been a congeries of all the different materials that compoſe the ſurface of the ſurrounding heights? But to whatever cauſe the origin of this accumulation may be aſcribed, certain it is that no ſoil whatever is more favourable to vegetation, or carries more abundant crops of every kind.

The ſurface of the clay, which, upon the retreat of the ſea, had been left in an almoſt level plane, is every where thickly covered with trees, chiefly oak and birch, many of them of a great ſize. Theſe trees ſeem to have been the firſt remarkable produce of the carſe; and it is probable they were propagated by diſſemination from the ſurrounding eminences. They are found lying in all directions beſide their roots, which ſtill continue firm in the ground in their natural poſition; and from impreſſions ſtill viſible, it is evident they have been cut with an axe or ſome ſimilar inſtrument. For the cutting of wood, the two common purpoſes are either to apply it to its proper uſe, or that the ground it occupies may be cultivated. In the preſent caſe, however, neither of theſe ends had been propoſed, ſince the trees, by being left juſt as they were cut, were not only entirely loſt, but the ground was rendered totally unfit for cultivation. Hence it is evident, that the downfal of this wood muſt be aſcribed to ſome more extraordinary cauſe; and to none more probably than to that expedient, which, as we learn from Dion Caſſius and other hiſtorians, the Romans put ſo extenſively in practice to diſlodge from their foreſts the ancient inhabitants of the Britiſh iſlands.

This hypotheſis acquires no ſmall degree of force from a circumſtance that occurred in May 1768, when a large round veſſel of thin braſs and curious workmanſhip, 25 inches in diameter and 16 inches in height, was diſcovered upon the ſurface of the clay buried under the moſs. This veſſel, found upon the eſtate of John Ramſay, Eſq; of Ochtertyre, was by that gentleman preſented to the Antiquarian Society, of Edinburgh; in whoſe muſeum it remains depoſited for preſervation. And in a liſt of the various donations preſented to that ſociety, publiſhed by them in 1782, it is there denominated a *Roman camp kettle*.

Betwen the clay and the moſs is found a ſtratum nine inches thick, partly dark brown and partly of a colour approaching to black. This is a vegetable mould, accumulated probably by the plants that covered the ground previous to the growth of the wood, and by leaves from the trees thereafter. The difference of colour muſt be owing to a difference in the vegetable ſubſtances that compoſe it. The brown mould is highly fertile; the other, eſpecially in a dry ſeaſon, is very unproductive. The crop that had occupied this mould when the trees were felled is found hidden in it. It conſiſts chiefly of heath; but ſeveral other ſmaller plants are alſo very diſtinguiſhable.

Immediately above this ſtratum lies the moſs, to the height, upon an average, of ſeven feet. It is compoſed of different vegetables arranged in three diſtinct ſtrata. Of theſe the firſt is three feet thick. It is black and heavy, and preferable to the others for the purpoſe of fuel. It conſiſts of bent-graſs *(agroſtis)*, which ſeems to have grown up luxuriantly among the trees after they were felled. The ſecond ſtratum alſo is three feet thick. It is compoſed of various kinds of moſſes, but principally of bog-moſs *(ſphagnum)*. It is of a ſallow or iron colour, and remarkably elaſtic. It is commonly called *white peat;* and for fuel is conſidered as much inferior to that above mentioned. The third ſtratum is compoſed of heath and a little bent-graſs, but chiefly of the deciduous parts of the former. It is about a foot thick, and black.

Three ſtrata of different vegetables lying above each other, the limits of each diſtinctly marked, and each diſtinguiſhed by a different colour, is certainly a curious natural phenomenon.

An inquiry will here occur, What has occaſioned this ſucceſſion in the vegetables of which the moſs is compoſed?

Every vegetable has a particular ſoil, more or leſs moiſt, peculiarly adapted to its nature. Let a piece of ground be in a moiſt ſtate, ruſhes will introduce themſelves; drain the ground ſufficiently, the ruſhes will diſappear, and finer vegetables will ſucceed. It ſeems reaſonable to account for the ſucceſſion of the different plants that compoſe the moſs on ſimilar principles.

Let us imagine an extenſive plain covered with trees lying in all directions, full of branches, and poſſibly loaded with leaves. This it is evident would produce a great ſtagnation of water, which, as the crops of bent graſs accumulated, would ſtill increaſe: and the probability is, that at length it had ſo increaſed, as to be the cauſe why the bent-graſs and other congenial plants of the firſt ſtratum ceaſed to grow. But it is evident that a plant was to be found that could live in ſuch a ſituation. Accordingly we ſee that bog-moſs had eſtabliſhed itſelf; a plant that loves even to ſwim in water.

When the accumulations of bent-graſs and the moſſes had, in proceſs of time, ariſen to the height of ſix feet above the ſurrounding *carſe* ground, the water that fell upon the ſurface had by no means an opportunity to diſcharge itſelf. It had accordingly formed many channels ~~which are~~ often three feet deep; and the intermediate ſurface being wholly turned into little hillocks has become dry and firm. By this means it became unfit for moſſes, and heath ſucceeded.

Such ſeems to have been the proceſs in the formation of what is now called *a moſs*.

By far the greateſt part of the moſs in queſtion is, upon an average, full ſeven feet deep, and has in all probability lain undiſturbed ſince its formation; this is called *High Moſs*, The remainder called the *Low Moſs*, lies to a conſiderable breadth around the extremities of the high; and is, upon an average, not above three feet in depth, to which it has been reduced by the digging of peats. Theſe are formed of that ſtratum of the moſs only that lies four feet below the ſurface and downwards; the reſt is improper for the purpoſe, and is thrown aſide.

Before the introduction of the plan which is now purſued, two methods chiefly were employed to gain land from the moſs. 1ſt, The ſurrounding farmers marked off yearly a portion of the Low Moſs next to their arable land, about 15 feet broad. This they removed with carts and ſpread upon their fields, ſome acres of which they for that end left unſown. Here it lay till May or June; when, being thoroughly dry, it was burnt to aſhes to ſerve as a manure. By this means they added to their farms about half a round of land yearly. But this plan proved unſucceſsful, for by the repeated application of theſe aſhes, the ſoil was rendered ſo looſe that the crops generaly failed. 2dly, Many farmers were wont to *trench down* the low moſs. and to cover it *furrow deep* with clay taken out of the trench. This, though commendable as an attempt to improve, proved likewiſe an unavailing method; becauſe in a dry ſeaſon the ſuperficial covering of clay retains ſo little moiſture that the crop commonly fails.

It has been attempted to cover the moſs with clay brought from the adjacent grounds. But what from neceſſary impoveriſhment of the ground from which the clay was carried, and the ſoftneſs of the moſs, this was ſoon found to be impracticable.

Hence it is evident, that all attempts to *improve* this moſs muſt ever prove abortive; and that the object to be had in view is the acquiſition of the valuable ſoil lying underneath; to which end nothing leſs is requiſite than the total abolition of the the moſs.

Draining has alſo been propoſed as another mode of improvement; and it muſt be acknowledged, that, by means of draining, many moſſes have been converted both into arable and meadow grounds, which in the end became intereſting improvements. But in a moſs, ſuch as that of Kincardine, this method would be ineffectual; as for ſeveral feet deep it is of ſuch a nature, that upon being dry and divided into parts, it would blow with the wind like chaff; and when thrown aſide in the opperation of digging peats, it lies for years without producing a ſingle vegetable, except only a few plants of ſorrel.

By the methods above deſcribed from 100 to 200 acres of moſs had been removed. When the preſent plan was introduced, there ſtill remained covered with moſs from 1300 or 1400 acres of carſe clay—a treaſure for which it muſt be ever intereſting to dig.

In the year 1766 Lord Kames entered into poſſeſſion of the eſtate of Blair Drummond. Long before that period he was well acquainted with the moſs, and often lamented that no attempt had ever been made to turn it to advantage, Many different plans were now propoſed; at length it was reſolved to attempt, by means of water as the moſt powerful agent, entirely to ſweep off the whole body of moſs.

That moſs might be floated in water, was abundantly obvious; but to find water in ſufficient quantity was difficult, the only ſtream at hand being employed to turn a corn-mill. Convinced of the ſuperior conſequence of dedicating this ſtream to the purpoſe of floating off the moſs, Lord Kames having made an agreement with the tenant who farmed the mill, and the tenants thirled conſenting to pay the rent, he immediately threw down the mill, and applied the water to the above purpoſe.

In order to determine the beſt manner of conducting the operation, workmen were now employed for a conſiderable time upon Law Moſs both by the day and by the piece, to aſcertain the expence for which a given quantity of moſs could be removed. It was then agreed to operate at a certain rate per acre; and in this manner ſeveral acres were removed.

But this was to be a very expenſive proceſs. The ground gained might, indeed, be afterwards let to tenants; but every acre would require an expenditure from 12l. to 15l. before it conld be ready for ſowing; ſo that the acquiſition of the whole, computing it at a medium to be 1350 acres, would ſink a capital of nearly 20,000 l. ſterling.

One other method ſtill remained; namely, to attempt letting portions of the moſs, as it lay, for a term of years ſufficient to indemnify tenants for the expences incurred in removing it. For ſome time both theſe plans were adopted; but ſeveral reaſons made the latter preferable. 1. The quantity of water to be had was ſmall; and being alſo uncertain, it was very inconvenient for an undertaker; neither were there any houſes near the ſpot, which occaſioned a great loſs of time in going and coming; but when a man ſhould live upon the ſpot, then he could be ready to ſeize every opportunity. 2. The moſs was an uſeleſs waſte. To let it to tenants would increaſe the population of the eſtate, and afford to a number of induſtrious people the means of making to themſelves a comfortable livelihood.

In the mean time it was determined, till as many tenants ſhould be got as could occupy the whole water, to carry on the work by means of undertakers.

But before proceeding farther, it will be neceſſary to deſcribe the manner of applying water to the purpoſe of floating the moſs.

A ſtream of water ſufficient to turn a common corn-mill will carry off as much moſs as 20 men can throw into it, provided they be ſtationed at the diſtance of 100 yards from each other. The firſt ſtep is to make in the clay, along-ſide of the moſs, a drain to convey the water; and for this operation the carſe-clay below the moſs is peculiarly favourable, being perfectly free from ſtones and all other extraneous ſubſtances, and at the ſame time, when moiſt, ſlippery as ſoap; ſo that not only is it eaſily dug, but its lubricity greatly facilitates the progreſs of the water when loaded with moſs. The dimenſions proper for the drain are found to be two feet for the breadth, and the ſame for the depth. If ſmaller, it could not conveniently receive the ſpadefuls of moſs; if larger, the water would eſcape, leaving the moſs behind. The drain has an inclination of one foot in 100 yards: the more regularly this inclination is obſerved throughout, the leſs will the moſs be liable to obſtructions in its progreſs with the water. The drain being formed, the operator marks off to a convenient extent along-ſide of it a ſection of moſs 10 feet broad; the greateſt diſtance from which he can heave his ſpadeful into the drain. This he repeatedly does till the entire maſs be removed down to the clay. He then digs a new drain at the foot of the moſs-bank, turns the water into it, and proceeds as before, leaving the moſs to purſue its courſe into the river Forth, a receptacle equally convenient and capacious; upon the fortunate ſituation of which, happily forming for ſeveral miles the ſouthern boundary of the eſtate, without the interpoſition of any neighbouring proprietor, depended the very exiſtence of the whole operations.

When the moſs is entirely removed, the clay is found to be encumbered with the roots of different kinds of trees ſtanding in it as they grew, often very large: their trunks alſo are frequently found lying beſide them. All theſe the tenants remove often with great labour. In the courſe of their operations they purpoſely leave upon the clay a ſtratum of moſs ſix inches thick. This, in ſpring, when the ſeaſon offers, they reduce to aſhes, which in a great meaſure enſures the firſt crop. The ground thus cleared is turned over, where the dryneſs admits, with a plough, and, where too ſoft, with a ſpade. A month's expoſure to the ſun, wind, and froſt, reduces the clay to a powder fitting it for the ſeed in March and April. A crop of oats is the firſt, which ſeldom fails of being plentiful, yielding from eight to ten bolls after one.

In the year 1767 an agreement was made with one tenant for a portion of the Low Moſs. This, as being the firſt ſtep towards the intended plan, was then viewed as a conſiderable acquiſition. The ſame terms agreed upon with this tenant have ever ſince been obſerved with all the reſt. They are as follow:

The tenant holds eight acres of moſs by a tack of 38 years; he is allowed a proper quantity of timber, and two bolls of oatmeal to ſupport him while employed in rearing a houſe; the firſt ſeven years he pays no rent; the eighth year he pays one merk Scots; the ninth year two merks; and ſo on with the addition of one merk yearly till the end of the firſt 19 years; during the laſt five years of which he alſo pays a hen yearly. Upon the commencement of the ſecond 19 years, he begins to pay a yearly rent of 12s. for each acre of land cleared from moſs, and 2s. 6d. for each acre not cleared, alſo two hens yearly: A low rent indeed for ſo fine a ſoil; but no more than a proper reward for his laborious exertions in acquiring it.

In the year 1768 another tenant was ſettled. Theſe two were tradeſmen; to whom the preference was always given, as having this great advantage to recommend them, that even when deprived of water they need never want employment. The motives that induced theſe people to become ſettlers were, 1*ſt*, The proſpect of an independent eſtabliſhment for a number of years. 2*dly*, The moſs afforded them great abundance of excellent fuel; to which was added the comfortable conſideration, that, while buſied in providing that neceſſary article, they had the double advantage of promoting, at the ſame time, the principal object of their ſettlement.

Notwithſtanding theſe inducements, ſtill ſettlers offered ſlowly; to which two circumſtances chiefly contributed. 1*ſt*, The whole farmers ſurrounding the moſs threw every poſſible obſtruction in their way. 2*dly*, By people of all denominations the ſcheme was viewed as a chimerical project, and became a common topic of ridicule. The plan however ſupported itſelf, and in the year 1769 five more tenants agreed for eight acres each; and thus 56 acres of Low Moſs were diſpoſed of. From the progreſs made by the firſt ſettlers, and the addition of theſe, the obloquy of becoming a moſs-tenant gradually became leſs regarded; ſo that in the year 1772 two more were added; in 1773, three; and in 1774, one; in all 13: which diſpoſed of 104 acres: all the Low Moſs to which water could then be conveyed. As water is the main ſpring of the operation, every tenant, beſide the attention neceſſary to his ſhare of the principal ſtream, collected water by every poſſible means, making ditches round his portion of the moſs, and a reſervoir therein to retain it till wanted.

The tenants in the Lower Moſs having now begun to raiſe good crops, in the year 1774 ſeveral perſons offered to take poſſeſſions in the High Moſs, upon condition that acceſs to it ſhould be rendered practicable. The High Moſs wanted many advantages that the Low poſſeſſed. To the Low Moſs, lying contiguous to the ſurrounding arable lands, the acceſs was tolerably good; but from the arable lands the High Moſs was ſeparated by 300 or 400 yards of the Low, which, even to a man, affords but indifferent footing, and to horſes is altogether impracticable. The Low Moſs is in general only three feet deep; the High Moſs is from ſix to twelve feet in depth.

It will appear at firſt ſight, that without a road of communication the High Moſs muſt for ever have proved unconquerable. Without delay, therefore, a road was opened to the breadth of twelve feet, for ſeveral hundred yards in length, by floating off the moſs down to the clay.

This being effected, and at the ſame time an opening given to admit water, in the year 1775 twelve tenants agreed for eight acres of High Moſs each. In conſideration of the greater depth of this part of the moſs, it was agreed, that during the firſt 19 years they ſhould pay no rent; but for the ſecond 19 years the terms of agreement were the ſame as thoſe made with the tenants in the Low Moſs. To the above-mentioned tenants every degree of encouragement was given; as upon their ſucceſs depended, in a great meaſure, the diſpoſal of the great quantity of moſs ſtill remaining. But their ſucceſs, however problematical, was ſuch, that next year,

1776, 6 more took 8 acres each,
1777, 3
1778, 1
1779, 4
1780, 1
1781, 1
1782, 1

In all, including thoſe upon the Low Moſs, 42 tenants, occupying 336 acres.

Though for ſome time the diſpoſal of the High Moſs went but ſlowly on, it was not for want of tenants; but the number of operators was already ſufficient for the quantity of water; to have added more would evidently have been imprudent.

In the year [illegible] Mr Drummond entered into poſſeſſion of the eſtate of Blair Drummond, and entered fully into the plan adopted by his predeceſſor for ſubduing the moſs. At this time there ſtill remained undiſpoſed of about [illegible] acres of High Moſs. As water was the great deſideratum, it was determined, that to obtain that neceſſary article neither pains nor expence ſhould be wanting. Steps were accordingly taken to aſcertain in what manner it might be procured to moſt advantage.

Meanwhile, to prepare for new tenants a ſecond road parallel to the former, at the diſtance of half a mile, was immediately begun and cut, with what water could be got, down to the clay, 12 feet broad and 2670 yards long, quite acroſs the moſs. This opening was previouſly neceſſary, that operators might get a drain formed in the clay to direct the water; and it was to remain as a road that was abſolutely neceſſary, and which relieved ſettlers from an expence they were unable to ſupport. Theſe preparations, the progreſs of the former tenants, and the proſpect of a farther ſupply of water, induced 10 more to take poſſeſſions in the year 1783; in the year 1784, 18 more took poſſeſſions; and in 1785 no fewer than 27;—in all, 55 tenants in three years, which diſpoſed of 440 acres more of the High Moſs.

As the introduction of an additional ſtream to the moſs was to be a work both of nicety and expence, it was neceſſary to proceed with caution. For this reaſon ſeveral engineers were employed to make ſurveys and plans of the different modes by which it might be procured. In one point they all agreed, that the proper ſource for furniſhing that ſupply was the river Teith; a large and copious ſtream that paſſes within a mile of the moſs: but various modes were propoſed for effecting that purpoſe.

To carry a ſtream from the river by a cut or canal into the moſs was found to be impracticable; and Mr Whitworth (A) gave in a plan of a pumping machine, which he was of opinion would anſwer the purpoſe extremely well.

Soon after this Mr George Meikle of Alloa, a very ſkilful and ingenious mill-wright, gave in a model of a wheel for raiſing water entirely of a new conſtruction, of his own and his father's invention jointly. This machine is ſo exceedingly ſimple, and acts in a manner ſo eaſy, natural, and uniform, that a common obſerver is apt to undervalue the invention: But perſons ſkilled in mechanics view machinery with a very different eye; for to them ſimplicity is the firſt recommendation a machine can poſſeſs. Accordingly, upon ſeeing the model ſet to work, Mr Whitworth, with that candour and liberality of mind that generally accompany genius and knowledge, not only gave it the greateſt praiſe, but declared that, for the purpoſe required, it was ſuperior to the machine recommended by himſelf, and adviſed it to be adopted without heſitation.

The better, to explain this machine, two ſketches are annexed, to the firſt of which the following letters refer. The explanation of the ſecond will be found upon the ſketch.

Plate CCCXVI. *a*. Sluice through which is admitted the water that moves the wheel.

b, *b*. Two ſluices through which is admitted the water raiſed by the wheel.

c, *c*. A part of one of two wooden troughs and an aperture in the wall, through which, the above water is conveyed into the buckets. [The other trough is hid by two ſtone walls that ſupport the wheel.]

d, *d*, *d*. Buckets, of which 80 are arranged on each ſide of the arms of the wheel = 160.

e, *e*, *e*. A ciſtern, into which the water raiſed by the buckets is diſcharged.

f, *f*, *f*. Wooden barrel-pipes, through which the water deſcends from the ciſtern underground, to avoid the high road from Stirling and the private approach to the houſe.

Sketch ſecond contains a plan of the ciſtern, and exhibits the manner in which the water is filled into the buckets.

The diameter of the wheel to the extremities of the float-boards is 28 feet; the length of the float-boards, 10 feet. The wheel makes nearly four revolutions *per* minute; in which time it diſcharges into the ciſtern 40 hogſheads of water. But this is not all the wheel is capable of performing; for by ſeveral accurate trials by Meſſrs Whitworth and Meikle, in the reſult of which, though made ſeparately, they perfectly agreed, it was found that the wheel was able to lift no leſs than 60 hogſheads *per* minute; but that the diameter of the pipes through which the water deſcends from the ciſtern would not admit a greater quantity than what they already receive.

To a perſon at all converſant in hydraulics, the reſemblance of this to the Perſian wheel muſt be obvious: and indeed it is probable, that from the Perſian wheel the firſt idea of this machine was derived. But admitting this, ſtill the ſuperiority of the preſent wheel is, in moſt reſpects, ſo conſpicuous, as to entitle it to little leſs praiſe than the firſt invention. For, 1ſt, In the Perſian wheel, the buckets being all moveable, muſt be conſtantly going out of order: In this wheel they are all immoveable, conſequently never can be out of order. 2dly, Inſtead of lifting the water from the bottom of the fall as in the Perſian wheel, this wheel lifts it from the top of the fall, being from four to five feet higher; by which means ſome additional power is gained. 3dly, By means of the three ſluices (*a*, and *b*, *b*, fig. 1.) in whatever ſituation the river may be, the quantity of the water to be raiſed is ſo nicely adjuſted to that of the moving power, as conſtantly to preſerve the wheel in a ſteady and equable motion. In ſhort, as a regulator is to a watch, ſo are theſe ſluices to this wheel, whoſe movements would otherwiſe be ſo various, as ſometimes to carry the water clear over the ciſtern, ſometimes to drop it entirely behind, but ſeldom ſo as fully to diſcharge the whole contents of the buckets into the ciſtern.

It is however but candid to remark, that this machine labours under a ſmall defect, which did not eſcape the obſervation of Mr Whitworth; namely, that by raiſing the water about 3½ feet higher than the ciſtern where it is ultimately delivered, a ſmall degree of power is loſt. To this indeed he propoſed a remedy; but candidly confeſſed, that, as it would render the machine

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(A) This gentleman is ſuperintendant of the London water-works, and an engineer of great reputation in England. He was ſeveral years employed in Scotland in completing the great canal.

ſomewhat more complex, and would alſo increaſe the friction, he thought it more adviſable to keep it in its preſent ſtate. At the ſame time he juſtly obſerved, that as the ſtream by which the wheel is moved is at all times copious and powerful, the ſmall loſs of power occaſioned by the above circumſtances was of little or no avail.

This ſtream is detached from the Teith at the place where that river approaches neareſt to the moſs. The ſurface of the latter is about 15 feet higher than that of the former; the ciſtern is therefore placed 17 feet above the ſurface of the ſtream, ſo as to leave a declivity ſufficient to deliver the water upon the ſurface of the moſs.

The pipes through which the water deſcends from the ciſtern are compoſed of wooden barrels hooped with iron 4 feet long and 18 inches in diameter within.

In theſe pipes, having been conveyed under ground for 354 yards from the ciſtern, the water at once emerges into an open aqueduct. This aqueduct, which was formed according to a plan by Mr Whitworth, is conſtructed wholly of earth or clay; and in order to keep the water on a level with the ſurface of the moſs, it is for nearly two thirds of its courſe elevated from 8 to 10 feet above the level of the adjacent grounds; the baſe being 40 feet broad, the ſummit 18 feet, and the water-courſe 10 feet broad. It commences at the termination of the pipes; from whence extending above 1400 yards, it diſcharges the water into a canal formed for its reception on the ſurface of the moſs.

For raiſing the water to this height there were two reaſons. 1ſt, That not only where it was delivered on the moſs, but even after being conveyed to the moſt diſtant corners, it might ſtill retain ſufficient power to tranſport the moſs to the river Forth. 2dly, That reſervoirs of a ſufficient height might be formed in the moſs to retain the water delivered during night.

In conſequence of Mr Whitworth's advice, a contract was entered into with Mr Meikle in ſpring 1787; and by the end of October in that year, the wheel, pipes, and aqueduct, were all completely finiſhed: and what in ſo complex and extenſive an undertaking, is by no means common, the different branches of the work were ſo completely executed, and ſo happily adjuſted to each other, that upon trial the effect anſwered the moſt ſanguine expectations. The total expence exceeded L. 1000 Sterling.

To induce the proprietor to embark in this undertaking, the moſs tenants had of their own accord previouſly come under a formal engagement to pay the intereſt of any ſum that might be expended in procuring a ſupply of water. But he was determined they ſhould not enjoy by halves the ſweets of this long-wiſhed for acquiſition. With a view therefore, not only to reward their paſt induſtry, but to rouſe them to future exertions, he at once ſet them free from their engagement; nor has any intereſt ever been demanded.

This new ſupply was a moſt acceptable boon to the moſs tenants.—In order to make an equitable diſtribution, the water raiſed through the day was allotted to one diviſion of operators; that raiſed during the night to another. To retain the latter, a canal was formed, extending almoſt three miles through the centre of the moſs. From place to place along the ſides are inſerted ſluices to admit water to the reſervoirs of the poſſeſſors; each ſluice having an aperture proportioned to the number of operators to be ſupplied from the reſervoir which it fills. For the water raiſed through the day no reſervoirs are neceſſary; as it is immediately uſed by the diviſion to which it is allotted.

This additional ſtream, though highly beneficial, yet is not more than ſufficient to keep 40 men at conſtant work. But ſuch a quantity as would give conſtant work is not neceſſary; the operators muſt be often employed in making and repairing their drains, grubbing up roots of trees, &c.; ſo that a quantity ſufficient to give five or ſix hours work *per* day to the whole inhabitants is as much as would be wanted. But as the quantity procured was ſtill inſufficient for this purpoſe, a ſmall ſtream that deſcended from the higher grounds was diverted from its courſe and brought into the moſs. From want of level this ſtream could not be delivered to the greateſt advantage; namely, upon the ſurface of the moſs. Yet by making, at a conſiderable expence, a drain half a mile long, and a reſervoir for the night-water, it was rendered of much importance. And during the whole winter months, as well as in ſummer, after every fall of rain, it keeps 15 perſons fully employed.

In the year 1787 two more tenants agreed for eight acres each; in 1788, four; in 1789, eight; in 1790, four tenants, all agreed for the ſame number of acres.

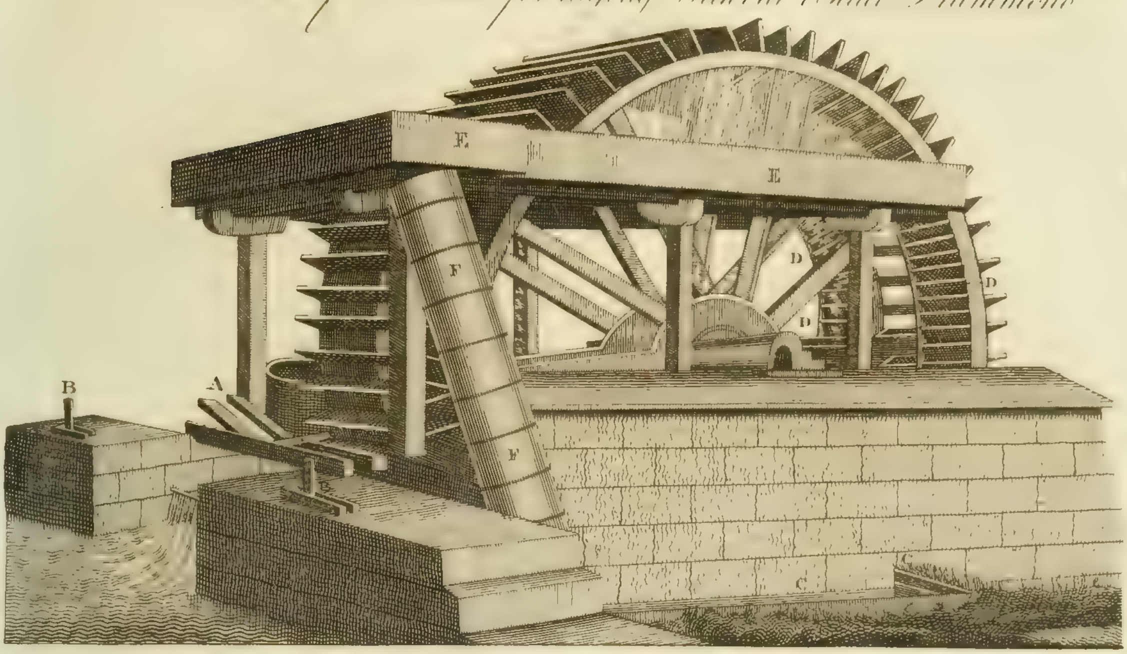
The whole moſs was now diſpoſed of, except that part called *Flow-moſs*, which comprehended about 400 acres. Here it is twice the uſual breadth, ſo fluid that a pole may be thruſt with one hand to the bottom; and the interior part, for near a mile broad, is three feet above the level of all the reſt of the moſs. Hitherto the many and various difficulties that preſented themſelves had been overcome by perſeverance and expence. But here the extraordinary elevation of the moraſs, joined to its great fluidity, ſeemed to exclude all poſſibility of admitting a ſtream of water; and it was the general opinion that the moſs operations had now arrived to the *ne plus ultra*, and that this moraſs was doomed to remain a nuiſance for ages to come.

But the proprietor had now advanced ſo far that he could not ſubmit to retreat: and he conſidered himſelf as, in ſome meaſure, pledged to the country for the completion of this undertaking. To detail the various methods practiſed to introduce a ſtream of water into that moraſs, would prove tedious. It is ſufficient to ſay, that after a thouſand unſucceſsful efforts, attended with much trouble and conſiderable expence, the point at laſt was gained, and a ſtream of water was brought in, and carried fairly acroſs the centre of the moraſs.

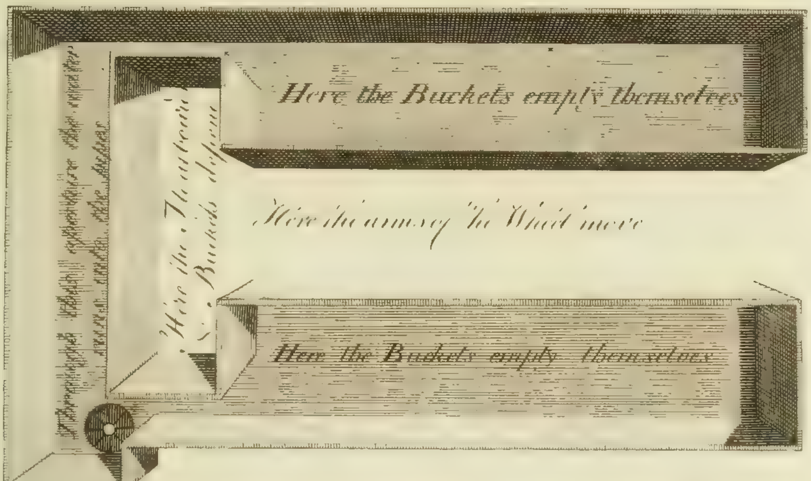
The greateſt obſtacle was now indeed overcome; but ſtill another remained of no ſmall moment, namely, the diſcouragement given to ſettlers from the total impoſſibility of erecting habitations upon the ſurface of this moraſs. To find a remedy for this evil was difficult. Happily a reſource at laſt occurred. This was to bargain with a certain number of the old tenants whoſe habitations were neareſt, to take leaſes of portions of the moraſs. But as ſome additional aid was here neceſſary, it was agreed that L. 12 Sterling ſhould be gradually advanced to each tenant till he ſhould accompliſh the clearing of an acre, for which he or his ſucceſſor is bound to pay 12s. of yearly rent,

equal

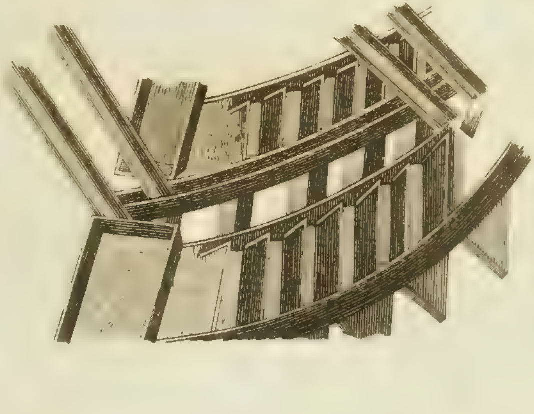
Sketch of the Wheel for raising Water at Blair Drummond



Sketch of the Cistern as seen from above


Here the Buckets empty themselves
Here the Arms of the Wheel move
Here the Buckets empty themselves
Through this aperture the water runs into the tubes
Here the Floatboards & Buckets descend

Sketch of the manner in which the water is filled from the Troughs into the Buckets



R. Scott Sculp.

equal to five *per cent.* upon the ſum advanced. When this point ſhall be gained, they are bound to diſpoſe, as moſt agreeable to themſelves, either of their old or of their new poſſeſſion; for which, when once an acre is cleared, purchaſers will not be wanting.

In conſequence of the above arrangement, during the year 1791, no fewer than 35 of the old tenants agreed, upon the foreſaid conditions, for eight acres each of the Flow-moſs. Thus 1200 acres are now diſpoſed of to 115 tenants. But when theſe 35 tenants ſhall each have cleared their acre, then, according to agreement, 35 additional tenants will ſpeedily be acquired; and the moſs will then contain in all 150 families.

To the leaſes already granted to the tenants in the High Moſs, it is now determined to add a further period of 19 years (making in all 57 years), during which they are to pay one guinea per acre; a rent not greater than the land is worth even at preſent, but greatly below its probable value at that diſtant period. This, it is hoped, will prove to the tenants a ſufficient incitement to continue their operations till their poſſeſſions are completely cleared from moſs.

Having now gone through, in detail, the whole progreſs of the colony ſince its firſt ſettlement in the year 1767, it ſtill remains to take a general view of the effects produced by that eſtabliſhment.

For ſeveral years, at firſt, the water was uſed chiefly to carry off moſs, in the forming of new roads, and preparing reſervoirs; which conſiderably retarded the principal object of gaining land. Nevertheleſs there have been cleared full 300 acres of excellent land producing wheat, barley, oats, and clover, yielding from ſix to twelve bolls after one.

From the nature of the undertaking, there is good reaſon to ſuppoſe that the operations will yearly advance with greater rapidity; eſpecially as the greater number of the ſettlers have only of late begun to operate. Many, beſides maintaining their families otherwiſe by occaſional employments, have in the High Moſs cleared in a year one rood of land; ſome have cleared two, ſome three roods, and in the Low Moſs an acre.

It was a remark often made, even by perſons of ſome obſervation, that by collecting together ſuch a number of people, Kincardine would be overſtocked; and the conſequence would be their becoming a burden on the pariſh: for as the bulk of them were labourers not bred to any trade, and poſſeſſed of little ſtock, it was foreſeen that, for ſome time, they could not afford to confine themſelves ſolely to the moſs, from which the return muſt be ſlow; but behoved, for immediate ſubſiſtence, to work for daily hire. Happily theſe predictions have proved entirely groundleſs; for ſuch is the growing demand for hands in this country, that not only do the whole of theſe people find employment whenever they chooſe to look for it, but their wages have been yearly increaſing from the time of their firſt eſtabliſhment. In ſhort, they have proved to the corner where they are ſet down a moſt uſeful nurſery of labourers; and thoſe very farmers who, at firſt, ſo ſtrongly oppoſed their ſettlement, now fly to them as a ſure reſource for every purpoſe of agriculture. Still they conſider the moſs-operations as their principal buſineſs; none pay them ſo well; and when they do leave it to earn a little money, they return with cheerfulneſs to their proper employment. Many of them already raiſe from 10 to 60 bolls of grain, and have no occaſion to go off to other work, which will ſoon be the caſe with the whole. Their original ſtock, indeed, did not often exceed L. 25, and ſome had not even L. 10; but what was wanting in ſtock is compenſated by induſtry.

Of the whole inhabitants full nine-tenths are Highlanders, from the neighbouring pariſhes of Callender, Balquhidder, &c.; a ſober, frugal, and induſtrious people, who, inured to hardſhips in their own country, are peculiarly qualified to encounter ſo arduous an undertaking. From this circumſtance, too, ariſes a very happy conſequence; that wearing a different garb and ſpeaking a different language from the people amongſt whom they are ſettled, they conſider themſelves in a manner as one family tranſported to a foreign land. And hence upon all occaſions of difficulty, they fly with alacrity to each others relief. Neither ought it to be forgotten, that, from their firſt ſettlement to the preſent day, not a ſingle inſtance has occurred amongſt them of theft, bad neighbourhood, or of any other miſdemeanor, that required the interpoſition of the civil magiſtrate. Nor, however poor in circumſtances, has any one of them ever ſtooped to ſolicit aſſiſtance from the funds of the pariſh appropriated to that purpoſe.

Though few of the tenants entered with a large ſtock, one only has been obliged to leave the moſs from incapacity to proceed. Many indeed have ſpent their ſmall ſtocks, and even run a little in debt: but in this caſe they have been permitted to ſell their tacks upon the following conditions: 1*ſt*, That the purchaſer ſhall be a good man; 2*d*, That the ſeller ſhall take another poſſeſſion. By this manœuvre a new inhabitant is gained; while the old one, relieved from debt, and aided by paſt experience, recommences his operations with double ſpirit upon a new poſſeſſion. The monied man, again, has at once a houſe and a piece of ground; the want of which, chiefly, ſtartled new beginners.

Some have even made a kind of trade of ſelling; inſomuch, that from the year 1774 to the preſent year 1792, no fewer than fifty ſales have taken place, producing in all the ſum of L. 849 Sterling. This proved from time to time a moſt ſeaſonable recruit to the colony, and gave new vigour and ſpirits to the whole.

The number of the ſettlers is productive of an excellent effect; and although ſome are generally abſent, enough ſtill remain to occupy the water conſtantly. In a favourable day there may be ſeen hundreds, men, women, and children, labouring with the utmoſt aſſiduity. The women declare they can make more by working at the moſs than at their wheel; and ſuch is the general attachment to that employment, that they have frequently been diſcovered working by moon-light.

Another happy conſequence ariſing from their numbers is the great quantity of moſs they conſume for fuel. There are in all 115 families. Each family requires at an average 10 dargues (B) of peats yearly.

(B) A dargue (or darg) of peats, is the quantity that one man can caſt and two can wheel in a day to the field where they are ſpread out to dry.

Each darg uncovers a ſpace equal to 10 ſquare yards of clay: ſo that by caſting peats, the moſs tenants gain yearly about 6 roods of land.

The advantage, too, of providing their fuel with ſo little trouble, is very great. They require yearly 1150 dargs of peats; which, as each darg when dried and ſtacked is valued at five ſhillings, are worth 287 l. 10s. ſterling; a ſum which otherwiſe muſt have been expended on the prime coſt and carriage of coals. Many of them caſt peats for ſale; and L. 100 worth are yearly diſpoſed of in the town of Sterling, the village of Down, &c.

Though moſs-work be laborious, it is at the ſame time amuſing. The operator moves the moſs five feet only at a medium; and the water, like carts in other caſes, carrying it off as faſt as it is thrown in, excites him to activity. Still he muſt ſubmit to be wet from morning to night. But habit reconciles him to this inconvenience; while his houſe and arable land fill his eye and cheer his mind. Nor is it found that the health of the inhabitants is in the ſmalleſt degree injured either by the nature of the work or the vicinity of the moſs.

The quantity of moſs that one man can move in a day is ſurpriſing; when he meets with no interruption, ſeldom leſs than 48 cubic yards, each weighing 90 ſtones. The weight, then, of moſs moved per day is no leſs than 4320 ſtones. A cubic yard is moved into the water, and of courſe carried into the river Forth for one farthing. It follows, that the expence of moving 48 cubic yards is one ſhilling. But the ſame quantity moved to the ſame diſtance by carts would coſt 24 ſhillings. Hence the advantage derived from the poſſibility of floating moſs in water, and the great importance of having water for that purpoſe.

The moſs, when contraſted with the rich lands ſurrounding, appeared, eſpecially before the improvements, a very dreary ſpot; one wide unvaried wild, totally unproductive, unfit even to furniſh ſuſtenance to any animal, except here and there a few wretched ſtraggling ſheep. Beſides, it entirely cut off all connection betwixt the farms on either ſide; amongſt which no intercourſe was practicable but by a circuit of ſeveral miles.

The ſcene is already greatly changed. The following are the numbers of the inhabitants now reſiding in the moſs; alſo of their cows and horſes, and of the acres gained by them from the moſs, together with their produce.

Men - - -	115
Women - -	113
Boys - - -	199
Girls - -	193
Total	620
Number of cows, at leaſt, -	115
Ditto of horſes and carts, -	34
Ditto of acres cleared from moſs, -	300

The produce in bolls cannot be exactly aſcertained: but, conſidering the goodneſs of the ſoil, may be fairly ſtated at 8 bolls per acre, *inde* 2400 bolls.

As oats are the ſtaple commodity, the calculation ſhall be confined to that grain. According to the fiars of Stirlingſhire, crop 1790 (the laſt crop for which they have been ſtruck), carſe oats are valued at 14 s. per boll. *Inde* 2400 bolls at 14 s. is L. 1680.

A track of ground ſo conſiderable, formerly a nuiſance to the country, thus converted into a fertile field, filled with inhabitants, comfortable and happy, cannot ſurely be ſurveyed with an eye of indifference by any perſon whoſe mind is at all ſuſceptible of feeling or of public ſpirit.

An excellent gravelled road 20 feet wide and a mile and a half long, is now carried quite acroſs the moſs. By this means, in the firſt place, a ſhort and eaſy intercourſe is eſtabliſhed between two conſiderable parts of the eſtate, formerly as little connected as if ſeparated by a lake or an arm of the ſea. Secondly, the inhabitants of the Moſs, to whom, hitherto, all paſſage with carts or horſes was impracticable for at leaſt one half of the year, have now obtained the eſſential advantage of being able, with eaſe, to tranſport all their different commodities at every ſeaſon of the year. This road was entirely formed by the hands of the moſs-tenants, and gravelled by their own carts and horſes: a work which, it will not be doubted, they performed with much alacrity; when it is conſidered that, to the proſpect of procuring a laſting and material benefit to themſelves, there was joined the additional inducement of receiving an immediate ſupply of money, the whole being done at the proprietor's expence.

The poſſeſſions are laid off in the manner beſt fitted for the operations; and are divided by lanes running in ſtraight lines parallel to each other. Parallel to theſe again the drains are carried; and this ſtraight direction greatly facilitates the progreſs of the water with its load of moſs. Upon the bank of moſs fronting the lanes, the operation of floating is begun; and twenty or thirty people are ſometimes ſeen heaving moſs into the ſame drain. That the water may be the more conveniently applied, the lanes include between them the breadth of two poſſeſſions only. The new houſes are erected upon each ſide of theſe lanes at the diſtance of 100 yards from each other.

Before the formation of lanes and roads, and while yet no ground was cleared, the firſt ſettlers were obliged to erect their houſes upon the ſurface of the moſs. Its ſoftneſs denied all acceſs to ſtones; which, at any rate, are at ſuch a diſtance as would render them too expenſive. Settlers, therefore, were obliged to conſtruct their houſes of other materials. Upon the Low Moſs there is found for this purpoſe great plenty of ſod or turf, which accordingly the tenants uſe for the walls of their houſes. For the rudeneſs of the fabric nature in ſome meaſure compenſates, by overſpreading the outſide with a luxuriant coating of heath and other mooriſh plants, which has a very pictureſque appearance.

But upon the High Moſs there is no ſod to be found. There the tenant muſt go differently to work. Having choſen a proper ſituation for his houſe, he firſt digs four trenches down to the clay, ſo as to ſeparate from the reſt of the moſs a ſolid maſs, containing an oblong, rectangular area, ſufficiently large for his intended houſe. This being done, he then ſcoops out the middle of the maſs, leaving on all ſides the thickneſs of three feet for walls; over which he throws a roof, ſuch as that by which other cottages are commonly covered.

Upon the ſofteſt parts of the moſs, even theſe walls cannot be obtained. In ſuch places the houſes are built with peat dug out of the moſs, and cloſely compreſſed together while in a humid ſtate (c). It is neceſſary even to lay upon the ſurface a platform of boards to prevent the walls from ſinking; which they have frequently done when that precaution was neglected. After all, to ſtamp with the foot will ſhake the whole fabric as well as the moſs for fifty yards around. This, at firſt, ſtartled the people a good deal; but cuſtom ſoon rendered it familiar.

The coloniſts have now made conſiderable advancement in rearing better habitations for their comfort and convenience. Their huts of turf are but temporary lodgings. As ſoon as they have cleared a little ground, they build houſes of brick; when the proprietor a ſecond time furniſhes them with timber gratis. It has alſo been found neceſſary to relieve them entirely from the payment of the burdenſome tax upon bricks; a tax which ſurely was never intended to fall on ſuch poor induſtrious adventurers; and which, without this aſſiſtance, would have proved a moſt effectual bar to the employment of theſe materials.

There are now erected in the moſs 69 brick-houſes, ſubſtantially built with lime. The total expence amounted to 1033 l. Sterling. And it is a very comfortable circumſtance, that the money expended upon theſe houſes is moſtly kept in circulation among the inhabitants themſelves: for as a number of them have learned not only to manufacture but alſo to build bricks, and as others who have horſes and carts furniſh the carriage of lime and coals, they thus interchange ſervices with each other.

With a view to excite the exertion of the coloniſts, the following premiums have lately been offered: 1. To the perſon who ſhall in the ſpace of one year remove the greateſt quantity of moſs down to the clay, a plough of the beſt conſtruction. 2. To the perſon who ſhall remove the next greateſt quantity, a pair of harrows of the beſt kind. 3. For the next greateſt quantity, a ſpade of the beſt kind, and 10 lb. of red clover-ſeed. But as theſe premiums, if conteſted for by the whole inhabitants, could reach but a very few of the number, they have therefore been divided into ſix diſtricts according to their ſituation, and the above premiums have been offered to each diſtrict.

The eſtabliſhment of this colony has no doubt been attended with a very conſiderable ſhare of expence and difficulty; for the undertaking was altogether new, and there were many prejudices againſt it, which it was neceſſary to overcome. At the ſame time it was noble and intereſting: it was to make a valuable addition to private property: it was to increaſe the population of the country, and to give bread to a number of people; many of whom having been turned out of their farms and cottaries in the Highlands, might otherwiſe, by emigration, have been loſt to their country; and that too at a time when, owing to the great enlargement of farms, depopulation prevails but too much even in the low countries. And it was to add to the arable lands of the kingdom, making many thouſand bolls of grain to grow where none ever grew before.

Theſe conſiderations have hitherto preponderated with the proprietors againſt the various obſtacles that preſent themſelves to the execution of ſo extenſive an undertaking. Should their example tend in any degree to ſtimulate others, who both in Scotland and in England poſſeſs much ground equally uſeleſs to the country, to commence ſimilar improvements, it would be a moſt grateful conſideration, ſuperadded to the pleaſure already ariſing from the progreſs of the infant colony.

Moss-Troopers, a rebellious ſort of people in the north of England, that lived by robbery and rapine, not unlike the tories in Ireland, the Bucaneers in Jamaica, or banditti of Italy. The counties of Northumberland and Cumberland were charged with an yearly ſum, and a command of men to be appointed by juſtices of the peace, to apprehend and ſuppreſs them.

MOSTRA, in the Italian muſic, a mark at the end of a line or ſpace, to ſhow that the firſt note of the next line is in that place: and if this note be accompanied with a ſharp or flat, it is proper to place theſe characters along with the moſtra.

MOSUL, or Mousul. See Mousul.

MOTACILLA, in ornithology, the Wagtail and Warbler: A genus of birds of the order of paſſeres; diſtinguiſhed by a ſtraight weak bill of a ſubulated figure, a tongue lacerated at the end, and very ſlender legs. Plate CCCXV.

1. The alba, or white wagtail, frequents the ſides of ponds and ſmall ſtreams, and feeds on inſects and worms. The head, back, and upper and lower ſide of the neck, as far as the breaſt, are black; in ſome the chin is white, and the throat marked with a black creſcent: the breaſt and belly are white; the quill-feathers are duſky; the coverts black, tipt and edged with white. The tail is very long, and always in motion, Mr Willoughby obſerves, that this ſpecies ſhifts its quarters in the winter; moving from the north to the ſouth of England during that ſeaſon. In ſpring and autumn it is a conſtant attendant on the plough, for the ſake of the worms thrown up by that inſtrument. Theſe birds make their neſt on the ground, compoſed of dry graſs, fine fibres of roots, and moſs lined within with hair or feathers. The eggs are five in number, white, ſpotted with brown; and for the moſt part there is only one brood in a year.

2. The flava, or yellow wagtail, migrates in the north of England, but in Hampſhire continues the whole year. The male is a bird of great beauty; the breaſt, belly, thighs, and vent-feathers, being of a moſt vivid and lovely yellow: the throat is marked with ſome large black ſpots; above the eye is a bright

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(c) This does not apply to the *moraſs*, upon the ſurface of which, it has already been obſerved, it is impoſſible to erect houſes in any ſhape.

yellow line: beneath that, from the bill, croſs the eye, is another of a duſky hue; and beneath the eye is a third of the ſame colour: the head and upper part of the body is of an olive-green, which brightens in the coverts of the tail; the quill-feathers are duſky; the coverts of the wings olive-coloured; but the lower rows duſky, tipt with yellowiſh white; the two outmoſt feathers of the tail half white; the others black, as in the former. The colours of the female are far more obſcure than thoſe of the male: it wants alſo theſe black ſpots on the throat. It makes its neſt on the ground, in corn-fields: the outſide is compoſed of decayed ſtems of plants, and ſmall fibrous roots; the inſide is lined with hair: it lays five eggs.

3. The regulus, or gold-creſted wren, is a native of Europe, and of the correſpondent latitudes of Aſia and America. It is the leaſt of all the European birds, weighing only a ſingle drachm. Its length is about four inches and an half; and the wings, when ſpread out, meaſure little more than ſix inches. On the top of its head is a beautiful orange-coloured ſpot called its *creſt*, which it can hide at pleaſure; the margins of the creſt are yellow, and it ends in a pretty broad black line; the ſides of the neck are of a beautiful yellowiſh green; the eyes ſurrounded with a white circle: the neck and back of a dark green mixed with yellow; the breaſt of a dirty white; the tail compoſed of 12 feathers of a brown colour, an inch and an half long, but not forked. In America it aſſociates with the titmice, running up and down the bark of lofty oaks with them, and collecting its food in their company, as if they were all of one brood. It feeds on inſects lodged in their winter dormitories in a torpid ſtate. It is ſaid to ſing very melodiouſly.

4. The ſialis, or blue-bird, is a native of moſt parts of North America; and is about the bigneſs of a ſparrow. The eyes are large; the head and upper part of the body, tail, and wings, are of a bright blue, excepting that the ends of the feathers are brown. The throat and breaſt are of a dirty red. The belly is white. It flies ſwiftly, having very long wings; ſo that the hawk generally purſues it in vain. It make its neſt in holes of trees; reſembles the robbin-red breaſt in its diſpoſition, and feeds only on inſects.

5. The ſutoria, or taylor-bird, is a native of the Eaſt-Indies. It is remarkable for the art with which it makes its neſt, ſeemingly in order to ſecure itſelf and its young in the moſt perfect manner poſſible againſt all danger from voracious animals. It picks up a dead leaf, and ſews it to the ſide of a living one: its ſlender bill is the needle, and its thread is formed of ſome fine fibres; the lining is compoſed of feathers, goſſamer, and down. The colour of the bird is light-yellow; its length three inches; and its weight only three-ſixteenths of an ounce: ſo that the materials of the neſt and its own ſize are not likely to draw down a habitation depending on ſo ſlight a tenure.

6. The luſcinia, or nightingale, exceeds in ſize the hedge-ſparrow. The bill is brown: the irides are hazel: the head and back pale tawny, daſhed with olive; the tail is of a deep tawny red; the under parts pale aſh-colour, growing white towards the vent; the quills are cinereous brown, with the outer margins reddiſh brown: the legs cinereous brown. The male and female are very ſimilar. This bird, the moſt famed of the feathered tribe for the variety, length, and ſweetneſs of its notes, is migratory, and ſuppoſed to be an inhabitant of the Aſiatic regions during ſuch times as it is not to be found in Europe. It is met with in Siberia, Sweden, Germany, France, Italy, and Greece; but in all thoſe places it is migratory, as in England. Haſſelquiſt ſpeaks of it as being in Paleſtine; and Fryer aſcertains its being found about Chulminor in Perſia: it is alſo ſpoken of as a bird of China, Kamtſchatka, and Japan; at which laſt place they are much eſteemed, and ſell dear; as they are alſo at Aleppo, where they are "in great abundance kept tame in houſes, and let out at a ſmall rate to ſuch as chooſe it in the city, ſo that no entertainment is made in the ſpring without a concert of theſe birds." They are not found in America, though ſeveral of their birds improperly bear that name; and it is uncertain whether they are found in Africa. This bird viſits Britain in the beginning of April, and leaves it in Auguſt; and during its continuance there, its range is confined to but a part of the iſland: it is not found in Scotland, Ireland, or North Wales, nor in any of the northern counties except Yorkſhire; and it does not migrate ſo far to the weſt as Devonſhire and Cornwall. They are ſolitary birds, never uniting into even ſmall flocks; and in reſpect to the neſts, it is very ſeldom that two are found near each other. The female builds in ſome low buſh or quickſet hedge well covered with foliage, for ſuch only this bird frequents; and lays four or five eggs of a greeniſh brown. The neſt is compoſed of dry leaves on the outſide, mixed with graſs and fibres, lined with hair or down within, though not always alike. The female alone ſits on and hatches the eggs, while the male not far off regales her with his delightful ſong; but as ſoon as the young are hatched, he commonly leaves off ſinging, and joins with the female in the taſk of providing for and feeding them. After the young can provide for themſelves, the old female provides for a ſecond brood, and the ſong of the male recommences. They have been known to have three broods in a year, and in the hot countries even four. Theſe birds are often brought up from the neſt for the ſake of their ſong. They are likewiſe caught at their firſt coming over; and though old birds, yet by management can be made to bear confinement, and to ſing equally with thoſe brought up from the neſt. None but the vileſt epicure, as Mr Latham remarks, would think of eating theſe charming ſongſters; yet we are told that their fleſh is equal to that of the ortolan, and they are fatted in Gaſcony for the table. Every ſchool-boy muſt have read of Heliogabalus eating of nightingales tongues; and that famed diſh of the Roman tragedian Æſop, which was compoſed of thoſe of every ſinging or talking bird, and is ſaid to have coſt about L. 6843 of our money.

7. The hippolais, or pettychaps, is ſomewhat leſs than a linnet. The bill is ſhort; the upper mandible black, the under bluiſh: above and below the eye there is a yellowiſh line: the head, neck, and upper parts are of a greeniſh aſh-colour; the quills and tail of a mouſe-colour, with greeniſh edges and black ſhafts; and the under wing-coverts are yellow: the belly is of a ſilvery white; the breaſt darker, and tinged with yellow: the legs are bluiſh or lead-coloured. This ſpecies is frequent in ſeveral parts of England, and makes a neſt

Mortacilla.

Motacilla,

of an arched form, compoſed of dry bents, mixed with a little moſs, and thickly lined with feathers: it is placed on the ground under a tuft of graſs or at the bottom of a buſh. The eggs are five in number, white, ſprinkled all over with ſmall red ſpots, moſt ſo at the largeſt end. In Dorſetſhire it is known by the name of *hay-bird*. In Yorkſhire it is called the *beam-bird*, from its neſtling under beams in outbuildings.

8. The atricapilla, or blackcap, is ſmaller than the pettychaps. The bill is brown: the top of the head is black; and the upper parts of the body are of a greeniſh aſh-colour: the ſides of the head and under parts are grey, changing to very light grey, or almoſt white, towards the vent: the quills and tail are cinereous brown, margined with the ſame colour as the upper parts: the legs are lead-coloured, and the claws black. This bird is pretty common in England, and elſewhere in Europe, as far as Italy; in all which places it is known to breed; coming in ſpring, and retiring in September. In Italy it builds twice in the year; in England only once. The neſt, which is generally placed in ſome low buſh not far from the ground, is compoſed of dried ſtalks, mixed with a little wool and green moſs round the verge; the inſide lined with the fibres of roots, thinly covered with black horſe-hair. The eggs are five in number; of a pale reddiſh brown, mottled with a deeper colour, and ſprinkled with a few dark ſpots. The male and female ſit by turns during incubation; and the young very early leap out of the neſt, eſpecially if any one approaches it, and forſake it for ever. The food is chiefly inſects; but in defect of theſe they will eat the fruits of ſpurge laurel, ſervice, and ivy; and ſeem to be even fond of the laſt, as they much frequent ſuch trees as are overgrown with it. The ſong is much eſteemed, and in many things almoſt equalling the nightingale itſelf; ſcarcely deficient, except in the delightful variety of note of the laſt named bird. Hence by many it has been named the *mock nightingale*.

9. The modularis, or hedge-ſparrow, a well-known bird, has the back and wing coverts of a duſky hue edged with reddiſh brown; rump of a greeniſh brown; throat and breaſt of a dull aſh-colour; the belly a dirty white; and the legs of a dull fleſh-colour. This bird frequents hedges in England; where it makes its neſt of moſs and wool, lining it with hair; and lays four or five eggs of a fine pale blue. In England and the more northern regions it is ſeen at all ſeaſons; but in France it is migratory, coming in October and departing northward in ſpring. The note of this bird would be thought pleaſant, did it not remind us of the approach of winter; beginning with the firſt froſts, and continuing till a little time in ſpring. Its often repeating the words *tit*, *tit*, *tit*, has occaſioned its being called *titling;* a name it is known by in many places.

10. The phœnicurus, or red-ſtart, is ſomewhat leſs than the red-breaſt: the forehead is white; the crown of the head, hind part of the neck, and back, are deep blue grey; the cheeks and throat black; the breaſt, rump, and ſides, red; and the belly is white: the two middle tail-feathers are brown; the reſt red; and the legs are black. The female has the top of the head and back cinereous grey; chin white. The ſame parts are red in this ſex as in the male, but not ſo bright. The wings are brown in both ſexes. This bird is migratory; coming hither in ſpring, and departing in autumn about October. It is not ſo ſhy as many birds in reſpect to itſelf; for it approaches habitations, and frequently makes its neſt in ſome hole of a wall where numbers of people paſs by frequently: yet it is content, if no one meddles with the neſt; for the leaſt derangement of the eggs, or almoſt looking at them, eſpecially if the female is diſturbed thereby, cauſes her to forſake the neſt altogether. It frequently builds alſo in ſome hole of a tree. The neſt is compoſed chiefly of moſs, lined with hair and feathers. The eggs are blue, and four or five in number. This bird frequently wags its tail; but does it ſideways like a dog when he is pleaſed, and not up and down like the wagtail. It is with difficulty that theſe birds are kept in a cage; nor will they ſubmit to it by any means if caught old. Their ſong has no great ſtrength: yet it is agreeable enough; and they will, if taught young, imitate the note of other birds, and ſing by night frequently as well as in the day time.

11. The ſalicaria, or ſedge-bird, is about the ſize of the blackcap, but more ſlender. The head is brown, marked with duſky ſtreaks: the cheeks are brown; with a white line over each eye, and above that a black one: the upper parts of the neck and back are of a reddiſh brown; and the wing-coverts and quills duſky; the under parts are white; but the breaſt and belly have a yellow tinge: the tail is brown, and much rounded; and the legs are duſky. This bird is common in England, and frequents places where reeds and ſedges grow, among which it is ſaid to make the neſt, though it has been known to do this on the loweſt branches of trees. The neſt is compoſed of ſtraw and dried fibres of plants, lined with hair; and the eggs five in number, of a dirty white, marbled with brown. It is obſerved to imitate the note of the ſwallow, ſky-lark, houſe-ſparrow, and other birds, in a pleaſing but hurrying manner, and ſings all night.

12. The ficedula, or epicurean warbler, is in length five inches; the upper parts are grey brown; the under parts greyiſh white, with a tinge of brown on the breaſt; and the legs are blackiſh. This is a bird much eſteemed on the continent for the delicate flavour of its fleſh. Their chief food is inſects; except in autumn, when they make great havock among the figs and grapes; whence it is ſuppoſed their great delicacy in ſome meaſure ariſes. It is not found in England, but met with in moſt of the intermediate parts between Sweden and Greece; where, however, it is only a ſummer inhabitant, probably retiring ſtill more ſouth at the approach of winter. In the iſle of Cyprus and Candy they abound greatly, inſomuch as to be an article of commerce. They tranſport them in veſſels filled with vinegar and ſweet herbs: the iſle of Cyprus alone collects 1000 or 1200 of theſe pots every year.

13. The rubecula, or red-breaſt, is univerſally known: the upper parts are of a greeniſh aſh-colour; the forehead, throat, neck, and breaſt, a rufous orange; the belly and vent whitiſh; the bill, legs, and ſides of the body, duſky. It is a conſtant inhabitant of Britain, as well as of the whole European continent from Sweden to Italy. It abounds in Burgundy and Lorraine, where numbers are taken for the table, and

Motacilla. thought excellent. It builds not far from the ground if in a buſh; though it ſometimes fixes on an outhouſe, or retired part of ſome old building. The neſt is compoſed of dried leaves, mixed with hair and moſs, and lined with feathers. The eggs are of a duſky white, marked with irregular reddiſh ſpots; and are from five to ſeven in number. The young, when full feathered, may be taken for a different bird, being ſpotted all over. The firſt rudiments of the red break forth on the breaſt about the end of Auguſt; but it is quite the end of September before they come to the full colour. Inſects are their general food; but in defect of theſe they will eat many other things. No bird is ſo tame and familiar as this; cloſely attending the heels of the gardener when he is uſing his ſpade, for the ſake of worms; and frequently in winter entering houſes where windows are open, when they will pick up the crumbs from the table while the family is at dinner. Its familiarity has cauſed a petty name to be given it in ſeveral countries. The people about Bornholm call it *Tommi-liden;* in Norway, *Peter Ronſmad;* the Germans, *Thomas Gierdet;* and we, the *Robin Red-breaſt.*

14. The rubicola, or ſtone-chatter, is in length about four inches and three quarters. The male has the upper parts of the body mixed blackiſh and pale rufous: on each ſide the neck there is a tranſverſe ſtreak of white: the breaſt is of a reddiſh yellow; the belly paler: and the legs are black. The female has the colours much leſs vivid. This bird inhabits dry places, ſuch as heaths and commons; living on inſects of all kinds. It makes its neſt early, at the foot of ſome low buſh, or under a ſtone; and lays five or ſix eggs of a bluiſh green, ſparingly marked with faint rufous ſpots. It is ſo very crafty as not to betray the place of the neſt, never alighting but at ſome diſtance, and creeping on the ground to it by the greateſt ſtealth. It is a reſtleſs bird, inceſſantly flying from buſh to buſh; and ſeems to have received its Engliſh name from its note, reſembling the clicking of two ſtones together.

15. The rubetra, or whin-chat, is ſomewhat bigger than the ſtone-chatter. The upper parts are blackiſh, edged with rufous: from the bill ariſes a ſtreak of white, which paſſes over the eye on each ſide, almoſt to the hind head: beneath this the cheeks are blackiſh; the chin is white; the reſt of the under parts rufous white: on the wing, near the ſhoulder, is a tranſverſe white mark, and another ſmaller near the baſtard wing, on the outer edge: the legs are black. The female differs in being paler, and the ſpots on the wings and the white trace over the eye being far leſs conſpicuous. This is not uncommon in Britain, and is ſeen along with the ſtone-chatter on the heaths during the ſummer months; where it breeds, making the neſt much after the manner of that bird. It lays five dirty white eggs, dotted with black. This ſpecies is common alſo on the continent of Europe, in France, Italy, Germany, and the more temperate parts of Ruſſia; but it is ſaid to be leſs common than the ſtone-chatter there, as it is alſo in England. Its food is chiefly inſects; and is ſaid to be as good as the ortolan, when fat and in good condition.

16. The œnanthe, or wheat-ear, is in length five inches and a half. The top of the head, hind part of the neck, and back, are of a bluiſh grey; and over the eye a ſtreak of white: the under parts of the body yellowiſh white, changing to pure white at the vent: the breaſt is tinged with red; and the legs are black. This bird is met with in moſt parts of Europe, even as far as Greenland; and ſpecimens have alſo been received from the Eaſt Indies. It viſits England annually in the middle of March, and leaves it in September. It chiefly frequents heaths. The neſt is uſually placed under ſhelter of ſome turf, clod, ſtone, or the like, always on the ground, and not unfrequently in ſome deſerted rabbit-burrow. It is compoſed of dry graſs or moſs, mixed with wool, fur of the rabbit, &c. or lined with hair and feathers. The eggs are from five to eight in number, of a light blue, with a deeper blue circle at the large end. The young are hatched in the middle of May. In ſome parts of England theſe birds are in vaſt plenty. About Eaſtbourn in Suſſex they are taken in ſnares made of horſe-hair placed beneath a long turf: Being very timid birds, the motion of a cloud, or the appearance of an hawk will drive them for ſhelter into theſe traps, and ſo they are taken. The numbers annually enſnared in that diſtrict alone amount to about 1840 dozen, which uſually ſell at ſixpence per dozen. Quantities of theſe are eaten on the ſpot by the neighbouring inhabitants; others are picked, and ſent up to the London poulterers and many are potted, being as much eſteemed in England as the ortolan on the continent. Their food is inſects only; though in rainy ſummers they feed much on earth-worms, whence they are fatteſt in ſuch ſeaſons.

17. The cyanea, or ſuperb warbler, a moſt beautiful ſpecies, is five inches and a half long. The bill is black: the feathers of the head are long, and ſtand erect like a full creſt; from the forehead to the crown they are of a bright blue; from thence to the nape, black like velvet: through the eyes from the bill there runs a line of black; and beneath the eye ſprings a tuft of the ſame blue feathers; beneath which, and on the chin, it is of a deep blue almoſt black, and feeling like velvet; on the ears is another patch of blue, and acroſs the back part of the head a band of the ſame; the whole giving the head a greater appearance of bulk than is natural: the hind part of the neck, and upper parts of the body and tail, are of a deep blue black; the under, pure white: the wings are duſky; the ſhafts of the quills cheſnut: the legs are duſky brown; the claws black. It inhabits Van Diemen's Land, the moſt ſouthern part of New Holland. The female of this ſpecies, of which a figure is given in Phillips's Voyage to Botany Bay, is diſcovered to be entirely deſtitute of all the fine blue colours, both pale and dark, by which the male is adorned, except that there is a very narrow circle of azure round each eye, apparently on the ſkin only: all the upper feathers conſiſt of ſhades of brown, and the whole throat and belly is pure white. Except from the ſhape and ſize, this bird would not be ſuſpected at firſt ſight to belong to the ſame ſpecies as the male: the epithet of *ſuperb* applies very ill to the female.

18. The troglodytes, or wren, is a very ſmall ſpecies, in length only three inches three quarters, though ſome have meaſured four inches. The bill is very ſlender, and of a duſky brown colour: the head, neck, and back, are of a reddiſh brown; and over each eye

a pale reddiſh white ſtreak ; the under parts, as far as the breaſt, are of this laſt colour ; the reſt more inclined to brown, croſſed with brown lines ? the legs are pale brown. It generally carries the tail erect. The neſt is of a curious conſtruction, in ſhape almoſt oval, and has only one ſmall entrance ; it is chiefly compoſed of moſs, well lined with feathers. In this the female lays from 10 to 16 or even 18 eggs, which are almoſt white, with reddiſh markings at the large end. She builds twice in a year, in April and June. The neſt is frequently found in ſome corner of an outhouſe, ſtack of wood, hole in a wall, or ſuch like, if near habitations ; but in the woods often in a buſh near the ground, in a ſtump of a tree, or on the ground itſelf. This minute bird is found throughout Europe ; and in England it defies the ſevereſt winters. Its ſong is much eſteemed, being, though ſhort, a pleaſing warble, and much louder than could be expected from the ſize of the bird : it continues throughout the year.

Above 150 other ſpecies, beſides varieties, are enumerated by ornithologiſts.

MOTE, in law books, ſignifies court or convention ; as a ward-mote, burgh-mote, ſwain-mote, &c.

Mote, was alſo uſed for a fortreſs or caſtle ; as *moto de Windſor*, &c.

Mote alſo denoted a ſtanding water to keep fiſh in : and ſometimes a large ditch encompaſſing a caſtle or dwelling-houſe,

Mote-Bell or *Mot-Bell*, the bell ſo called, which was uſed by the Engliſh Saxons to call people together to the court. See Folkmote.

MOTHE, in zoology. See Phalæna.

MOTHE LE VAYER (Francis de la), counſellor of ſtate, and preceptor to the duke of Anjou, only brother to Louis XIV. was born at Paris in the year 1588. He was well educated by a learned father, whoſe merits and employment rendered him of conſequence ; and he became ſo eminently learned himſelf, and diſtinguiſhed by his writings, that he was conſidered as one of the beſt members of the French academy, into which he was admitted in the year 1639. He was loved and conſidered by the two cardinals Richelieu and Mazarine, who governed France ſucceſſively. Splendid titles and honourable poſts were beſtowed upon him. He was appointed preceptor to the duke of Anjou, as we have ſaid, and would have been preceptor alſo to the king his brother, if the queen had not taken a particular fancy not to have that place beſtowed on a married man ; though Moreri in his Dictionary, and Peliſſon in his Hiſtory of the French Academy, both affirm that he was preceptor to his majeſty for the ſpace of one year. He was a man of a very regluar conduct, and a true philoſopher in his manner ; yet was ſuſpected of having no religion, As great a philoſopher as he was, however he was extremely afflicted as the loſs of his only ſon, who died when about 35 years of age ; and his grief diſordered him ſo much that in three months after he married again, although he was above 75 years old. Le Vayer lived a long time after his ſecond marriage, and died in the year 1672. His works, collected into a body by his ſon, were dedicated to cardinal Mazarine in 1653 : but the beſt and completeſt collection of them was that of Paris 1669, dedicated to Louis XIV. and conſiſting of 15 volumes in 12mo. "There is no ſmall advantage (ſays Bayle) to be made of reading this writer : and we have no French author that approaches nearer to Plutarch than he. We find beautiful thoughts and ſolid arguments interwoven and diſperſed through all he wrote ; wit and learning go hand in hand. His treatiſe concerning the education of the dauphin, and that of pagan philoſophy, are the beſt which he hath written."

MOTHER, a term of relation, denoting a woman who hath born a child.

Mother of Pearl. See Mytilus.

1
Motion

MOTION is now generally conſidered as incapable of definition, being a ſimple idea or notion received by the ſenſes. The ancients, however, thought differently. Some of them defined it to be a paſſage out of one *ſtate* into another ; which conveys no idea to him who is ignorant of the nature of motion.—The peripatetic definition has been mentioned elſewhere, and ſhown to be wholly unintelligible, as well as their celebrated diviſion of motion into ſome claſſes belonging to the three categories, *quality*, *quantity*, and *where* : (ſee Metaphysics, n° 188, 189, 190.) The Carteſians, too, among the moderns, pretend to define motion, by calling it a paſſage or removal of one part of matter, out of the neighbourhood of thoſe parts to which it is immediately contiguous, into the neighbourhood of others. Borelli defines motion to be the ſucceſſive paſſage of a body from place to place. Others ſay that it is the application of a body to different parts of infinite and immoveable ſpace ; and a late writer * of uncommon acuteneſs has given as a definition of motion—*change of place.*

2
Several definitions of.

We have elſewhere offered our opinion of every poſſible attempt to define motion ; but as the author of the laſt quoted definition has endeavoured to obviate ſuch objections as ours, candour requires that he be heard for himſelf. " It is ſaid (he obſerves) by ſome, that change implies motion, and therefore cannot be a part of its definition being the very thing defined. To this I anſwer, We are ſpeaking of the ſenſible idea of motion, as it appears to our ſight ; now changes do appear to our view, and to all our ſenſes, which give us no idea of motion. Changes in heat or cold : in colour, flavour, ſmell, ſound, hardneſs, ſoftneſs, pain, pleaſure ; in theſe, and many other ideas, changes do not produce ideas like that produced by a ball rolling or a ſtone falling. We may perhaps, ultimately trace them to motion, but to inſenſible motions ; to motions which ariſe only in reflection, and conſtitute no part of the actual idea of change. We can, therefore, conceive of change without conceiving at the ſame time of motion.—Change is a generic idea, including many ſpecies ; motion, as a ſenſible idea, is a ſpecies of that genus. Change is therefore a neceſſary part of the definition of motion ; it marks the genus of the thing defined. Motion is a change ; but as there are many ſpecies of change, which of thoſe ſpecies is motion ? The anſwer is, It is a change of place. This marks the ſpecies ; and diſtinguiſhes it from change of colour, of temperament, and figure."

This is the ableſt defence of an attempt to define motion that we have ever ſeen ; and at firſt view the definition itſelf appears to be perfect. Ariſtotle, the prince of definers, " conſiders a definition ‡ as a ſpeech declaring what a thing is. Every thing eſſential to the thing defined, and nothing more, muſt be contained in the definition. Now the eſſence of a thing conſiſts of theſe two parts; firſt, what is *common* to it with other things of the ſame kind; and ſecondly, what *diſtinguiſhes* it from other things of the ſame kind. The firſt is called the *genus* of the thing; the ſecond, its *ſpecific difference.* The definition, therefore, conſiſts of thoſe two parts."

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* See an Eſſay on the Powers and mechaniſm of Nature, by Robert Young.

‡ See Dr Reid's account of Ariſtotle's logic, in Lord Kames's Sketches of Man.

3
Shown not to declare what the thing is; and therefore to be no definition.

In obedience to this rule, the definition under conſideration ſeems to conſiſt of the *genus*, ſignified by the word *change*; and of the *ſpecific difference*, denoted by the words *of place*. But does the ſpeech *change of place* really declare what motion is? We cannot admit that it does; as, in our apprehenſion, a *change of place* is the *effect* of motion, and not *motion itſelf*. Suppoſe a lover of dialectic undertaking to define the ſtroke by which he ſaw his neighbour wounded with a bludgeon: what ſhould we think of his art were he to call it a contuſion on the head? He might ſay that *contuſion* is a general term, as contuſions may be produced on the arms, on the legs, and on various parts of the body; and as there are many ſpecies of contuſion, if he were aſked which of thoſe ſpecies was the ſtroke to be defined, he might anſwer, "a contuſion on the head. Here would be apparently the *genus* and *ſpecific difference*; the former denoted by *contuſion* and the latter by the words *on the head*. But would this be a definition of a ſtroke? No, ſurely: a contuſion on the head may be the *effect* of a ſtroke; but it can no more be the *ſtroke itſelf*, than a blow can be a bludgeon, or a fleſh-wound the point of a ſword. Equally evident it is, that a change of place cannot be motion; becauſe every body muſt have been actually moved before we can diſcern, or even conceive, a change of its place.

The *act of changing place* would perhaps come nearer to a definition of motion; but ſo far would it be from "a ſpeech declaring what motion is," that we are confident a man who had never by any of his ſenſes perceived a body in actual motion, would acquire no ideas whatever from the words "act of changing place." He might have experienced changes in heat, cold, ſmell, and ſound; but he could not poſſibly combine the ideas of ſuch changes with the ſignification of the word *place*, were he even capable of underſtanding that word, which to us appears to be more than doubtful. (See METAPHYSICS, n° 40, 41.)

4
The diſtinctions of motion into different kinds inſignificant.

The diſtinctions of motion into different kinds have been no leſs various, and no leſs inſignificant, than the ſeveral definitions of it. The moderns who reject the peripatetic diviſion of motion into four claſſes, yet conſider it themſelves as either *abſolute* or *relative*. Thus we are told, that "*abſolute motion* is the change of abſolute *place*, and that its celerity muſt be meaſured by the quantity of *abſolute ſpace* which the moving body runs through in a given time." "*Relative motion*, on the other hand, is a mutation of the *relative* or *vulgar place* of the moving body, and has its celerity eſtimated by the quantity of *relative ſpace* run through,"

Now it is obvious, that this diſtinction conveys no ideas with a farther explanation of the terms by which it is expreſſed: but that explanation is impoſſible to be given. Thus, before we can underſtand what *abſolute motion* is, we muſt underſtand what is meant by *abſolute place*. But abſolute place is a contradiction? for all *place* is *relative* and conſiſts in the poſitions of different bodies with regard to one another. Were a globe in the regions of empty ſpace to be put in motion by Almighty Power, and all the reſt of the corporeal worlds to be ſoon afterwards annihilated, the motion would undoubtedly continue unchanged; and yet, according to this diſtinction, it would be at firſt *relative* and afterwards *abſolute*. That the beginning of ſuch a motion would be *perceptible*, and the remainder of it *imperceptible*, is readily granted; but on this account to conſider it as of two kinds, is as abſurd as to ſuppoſe the motion of the minute-hand of a clock to be affected by our looking at it.

5
The opinions of the Carteſians and of Newton reſpecting the ſource of motion.

Leaving therefore theſe unintelligible diſtinctions, we now come to conſider a queſtion ſtill of a very abſtruſe nature, but much agitated among philoſophers, viz. What is the original ſource of motion in the creation? Is it natural to matter? or are we to aſcribe it to the immediate and continual agency of ſome *immaterial* being? The former has been ſtrenuouſly argued by the Carteſians, and the latter by the Newtonians. The arguments of the former, founded upon the chimerical hypotheſis of vortices and the original conſtruction of matter, were evidently inconcluſive; and the hypotheſis of Sir Iſaac Newton, who aſſerted that it was naturally *incapable* of motion, appeared more probable. To account for the quantity of motion in the univerſe, therefore, it became neceſſary to have recourſe either to the Deity, or to ſome ſuborbinate ſpiritual agent; and this became the more neceſſary, as the doctrine of an abſolute vacuum in the celeſtial ſpaces, that is, throughout the incomparably greateſt part of the creation, was one of the fundamental maxims of the ſyſtem. As it was abſolutely denied that matter exiſted in theſe ſpaces, and it was plain that the celeſtial bodies affected one another at immenſe diſtances, the powers of attraction and repulſion were naturally called in as the ſources of motion by their impulſes upon inert and ſluggiſh matter. Theſe being admitted, a ſpeculation enſued concerning their nature. *Spiritual*, it was confeſſed, they were; but whether they were to be accounted the immediate action of the divine Spirit himſelf, or that of ſome ſubordinate and inferior ſpirit, was a matter of no little diſpute. Sir Iſaac Newton towards the latter part of his life, began to relax ſomewhat of the rigidity of his former doctrine; and allowed that a very ſubtile medium, which he called *æther*, might be the cauſe of attraction and repulſion, and thus of the whole phenomena of nature. Since his time the multitude of diſcoveries in electricity, the ſimilarity of that fluid to fire and light, with the vaſt influence it has on every part of the creation with which we are acquainted, have rendered it very probable that the æther mentioned by Sir Iſaac is no other than the element of fire, "the moſt ſubtile † and elaſtic of all bodies, which ſeems to pervade and expand itſelf throughout the whole univerſe. Electrical experiments ſhow that this mighty agent is every where preſent, ready to break forth into action if not reſtrained and governed with the greateſt wiſdom. Being always reſtleſs and in motion, it actuates and enlivens the whole viſible maſs; is equally fitted to produce and to deſtroy; diſtinguiſhes the various ſtages of nature, and keeps up the perpetual round of generations and corruptions, pregnant with forms which it

6
A ſubtle æther the probable cauſe of attraction and repulſion.

† Siris, n° 153, &c.

it conſtantly ſends forth and reſorbs. So quick in its motions, ſo ſubtile and penetrating in its nature, ſo extenſive in its effects, it ſeemeth no other than the vegetative ſoul or vital ſpirit of the world.

7 The opinions of the ancients on this ſubject.

"The animal ſpirit in man is the inſtrument both of ſenſe and motion. To ſuppoſe ſenſe in the corporeal world would be groſs and unwarranted; but locomotive faculties are evident in all its parts. The Pythagoreans, Platoniſts, and Stoics, held the world to be an animal; though ſome of them have choſen to conſider it as a vegetable. However, the phenomena do plainly ſhow, that there is a ſpirit that moves, and a mind or providence that preſides. This providence, Plutarch ſaith, was thought to be in regard to the world what the ſoul is in regard to man. The order and courſe of things, and the experiments we daily make, ſhow that there is a mind which governs and actuates this mundane ſyſtem as the proper and real agent and cauſe; and that the inferior inſtrumental cauſe is pure æther, fire, or the ſubſtance of light, which is applied and determined by an infinite mind in the macrocoſm or univerſe, with unlimited power, and according to ſtated rules, as it is in the microcoſm with limited power and ſkill by the human mind. We have no proof either from experiment or reaſon of any other agent or efficient cauſe than the mind or ſpirit. When, therefore, we ſpeak of corporeal agents, or corporeal cauſes, this is to be underſtood in a different, ſubordinate, and improper ſenſe; and ſuch an agent we know light or elementary fire to be."

8 Experiments proving that a ſubtle æther may be the immediate cauſe of the planetary motions, &c.

That this elementary fire, abſorbed and fixed in all bodies, *may* be the cauſe of the univerſal principle of gravity, is made ſufficiently evident by numberleſs experiments. Homberg having calcined in the focus of a burning-glaſs ſome regulus of antimony, found that it had gained one tenth in weight, though the regulus, during the whole time of the operation, ſent up a thick ſmoke, and thereby loſt a conſiderable part of its own ſubſtance. It is in vain to alledge that any heterogeneous matter floating in the air, or that the air itſelf, may have been hurried into the maſs by the action of the fire. And that by this additional matter the weight was increaſed: for it is known experimentally, that if a quantity of metal be even hermetically ſecured within a veſſel of glaſs to keep of the air and all foreign matter, and the veſſel be placed for ſome time in a ſtrong fire, it will exhibit the ſame effect. "I have ſeen the operation performed (ſays Mr Jones†) on two ounces of pewter-filings, hermetically ſealed up in a Florence flaſk, which in two hours gained 55 grains, that is nearly one 17th. Had it remained longer in the fire, it might propably have gained ſomething more; as, in one of Mr Boyle's experiments, ſteel-filings were found to have gained a fourth.

"Of accounting for theſe effects there are but two poſſible ways: 1. If the quantity of matter be the ſame, or, in the caſe of calcination, be ſomewhat leſs, after being expoſed to the action of the fire, while the gravity of the whole is become greater; then does it follow that gravity is not according to the quantity of matter, and of courſe is not one of its properties. 2. If there be an increaſe of the maſs, it can be imputed to nothing but the matter of light or fire entangled in its paſſage through the ſubſtance, and ſo fixed in its pores, or combined with its ſolid parts, as to gravitate together with it. Yet it is certain, from the phenomenon of light darting from the ſun, that this elementary fire does not gravitate till it is fixed in metal, or ſome other ſolid ſubſtance.—Here then we have a fluid which gravitates, if it gravitate at all, in ſome caſes and not in others. So that which way ſoever the experiment be interpreted, we are forced to conclude that elementary or ſolar fire may be the cauſe of the law of gravitation."

That it is likewiſe in many caſes the cauſe of repulſion, is known to every one who has ſeen it fuſe metals, and convert water and mercury into elaſtic vapour. But there is a fact recorded by Mr Jones, which ſeems to evince that the ſame fluid, which as it iſſues from the ſun exhibits itſelf in the form of light and heat, is in other circumſtances converted into a very fine air, or cold æther, which ruſhes very forcibly towards the body of that luminary. "As a ſequel to what has been obſerved (ſays he) concerning the impregnation of ſolid ſubſtances with the particles of fire, give me leave to ſubjoin an experiment of M. de Stair. He tells us, that upon heating red lead in a glaſs whence the air was exhauſted by the rays of the ſun collected in a burning-glaſs, the veſſel in which the ſaid red lead was contained burſt in pieces with a great noiſe. Now, as all exploſions in general muſt be aſcribed either to an admiſſion of the air into a rarefied ſpace, or to what is called the *generation* of it; and as air was not admitted upon this occaſion, it muſt have been generated from the calx within the veſſel; and certainly was ſo, becauſe Dr Hales has made it appear that this ſubſtance, like crude tartar and many others, will yield a conſiderable quantity of *air* in diſtillation. What went into the metal therefore as *fire*, came out of it again as *air*; which in a manner forces upon us concluſions of ineſtimable value in natural philoſophy, and ſuch as may carry us very far into the moſt ſublime part of it."

One of the concluſions which the ingenious author thinks thus forced upon us, is, that the motion of the planets round the ſun, as well as round their own axis, is to be attributed to the continual agency of this fluid, under its two forms of elementary fire and pure air. As fire and light, we know that it ruſhes with inconceivable rapidity from the body of the ſun, and penetrates every corporeal ſubſtance, exerting itſelf ſometimes with ſuch a force as nothing with which we are acquainted is able to reſiſt. If it be indeed a fact, that this elementary fire, or principle of light and heat, afterwards cools, and becomes pure air, there cannot be a doubt, but that under ſuch a form it will return with great force, though ſurely in a ſomewhat different direction, towards the ſun, forming a vortex, in which the planets are included, and by which they muſt of courſe be carried round the centre. Mr Jones does not ſuppoſe that the air into which the principle of light and heat is converted, is of ſo groſs a nature as our atmoſphere. He rather conſiders it as cool æther, juſt as he repreſents light to be æther heated: but he maintains, that this æther, in its aerial form though not fit for human reſpiration, is a better *palulum* of fire than the air which we breathe.

This theory is exceedingly plauſible; and the author ſupports it by many experiments. He has not, indeed, convinced us that the ſolar light is converted or convertible into pure air; but he has, by juſt reaſoning from undoubted facts, proved that the whole expanſe of heaven, as far as comets wander, is filled not only with light, which is indeed obvious to the ſenſes, but alſo with a fluid, which, whatever it may be called, ſupplies the place of air in feeding the fire of theſe ignited bodies.

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† Eſſay on the Firſt Principles of Natural Philoſophy.

9
The exiſtence of ſuch an æther, however, does not completely ſolve the phenomena.

That the motion of the heavenly bodies ſhould reſult from the perpetual agency of ſuch a medium, appears to us a much more rational hypotheſis, than that which makes them act upon each other at immenſe diſtances through empty ſpace. But the hypotheſis is by no means ſo complete a ſolution of the phænomena as ſome of its fond admirers pretend to think it. This fluid, whether called æther, heat, light, or air, is ſtill material; and the queſtion returns upon him who imagines that it is ſufficient to account for gravitation, repulſion, magnetiſm, and coheſion, &c. "What moves the fluid itſelf, or makes the parts of which it is compoſed cohere together?" However widely it may be extended, it is incapable of poſitive infinity; and therefore *may be* divided into parts ſeparated from each other; ſo that it muſt be held together by a foreign force, as well as a ball of lead, or a piece of wax. As matter is not eſſentially active, the motion of this æther, under both its forms, muſt likewiſe be conſidered as an effect, for which we do not think that any propelling power, in the body of the ſun can be admitted as a ſufficient cauſe. For how comes the ſun to poſſeſs that power, and what makes the fluid return to the ſun? We have no notion of power, in the proper ſenſe of the word, but as intelligence and volition; and by the pious and excellent athor of the *Eſſay on the Firſt principles of Natural Philoſophy*, we are certain that the ſun was never ſuppoſed to be intelligent.

10
It is therefore by ſome ſuppoſed to be animated.
‡ Siris, nº 277.

Biſhop Berkeley, who admits of light or æther as the inſtrumental cauſe of all corporeal motion, gets rid of this difficulty, by ſuppoſing, with the ancients, that this powerful agent is animated. "According to the Pythagoreans and Platonics (ſays his Lordſhip ‡), there is a life infuſed throughout all things; the πυρ νοερον, πυρ τεχνικον, an intellectual and artificial fire, an inward principle, animal ſpirit, or natural life, producing and forming within, as art doth without; regulating, moderating, and reconciling the various motions, qualities, and parts of this mundane ſyſtem. By virtue of this life, the great maſſes are held together in their ordinary courſes, as well as the minuteſt particles governed in their natural motions, according to the ſeveral laws of attraction, gravity, electricity, magnetiſm, and the reſt. It is this gives inſtincts, teaches the ſpider her web, and the bee her honey. This it is that directs the roots of plants to draw forth juices from the earth, and the leaves and cortical veſſels to ſeparate and attract ſuch particles of air and elementary fire as ſuit their reſpective natures."

This life or animal ſpirit ſeems to be the ſame thing which Cudworth calls plaſtic nature, and which has been conſidered elſewhere. (See METAPHYSICS, nº 200 and *PLASTIC Nature.*) We ſhall therefore diſmiſs it at preſent, with juſt admitting the truth of the Biſhop's poſition, "that if nature be ſuppoſed the life of the world, animated by one ſoul, compacted into one frame, and directed or governed in all its parts by one ſupreme and diſtinct intelligence, this ſyſtem cannot be accuſed of atheiſm, though perhaps it may of miſtake or impropriety."

11
A new theory of motion.

A theory of motion ſomewhat ſimilar to that of Berkeley, though in ſeveral reſpects different from it, was not many years ago ſtated with great clearneſs, and ſupported with much ingenuity, in *An Eſſay on the Powers and Mechaniſm of Nature*, intended to improve, and more firmly eſtabliſh, the grand ſuperſtructure of the Newtonian ſyſtem. Mr Young, the author of the eſſay, admits, with moſt other philoſophers of the preſent age, that body is compoſed of atoms which are impenetrable to each other, and may be denominated ſolid. Theſe atoms, however, he does not conſider as primary and ſimple elements, incapable of reſolution into principles; but thinks that they are formed by certain motions of the parts of a ſubſtance immaterial and eſſentially active.

12
By ſuppoſing that a ſubſtance eſſentially active pervades the univerſe.

As this notion is uncommon, and the offspring of a vigorous mind, we ſhall conſider it more attentively under the article *PLASTIC Nature*. It is mentioned at preſent as a neceſſary introduction to the author's theory of motion, of which he attributes both the origin and the continuance to the agency of this elementary ſubſtance pervading the moſt ſolid atoms of the denſeſt bodies. Of every body and every atom he holds the conſtituent principles to be eſſentially active; but thoſe principles act in ſuch a manner as to counterbalance each other; ſo that the atom or body conſidered as a whole is inert, unleſs in ſo far as it reſiſts the compreſſion or ſeparation of its parts. No body or atom can of itſelf begin to move, or continue in motion for a ſingle inſtant: but being pervious to the active ſubſtance, and coaleſcing with it, that ſubſtance, when it enters any body, carries it along with it, till, meeting ſome other body in the way, either the whole of the active ſubſtance lodged in the former body paſſes into the obſtacle, in which caſe the impelling body inſtantly ceaſes to move; or elſe part of that ſubſtance paſſes into the obſtacle, and part remains in the impelling body; and in this caſe both bodies are moved with a velocity in proportion to the quantity of matter which each contains, combined with the quantity of active ſubſtance by which they are reſpectively penetrated.

13
Proofs of the exiſtence of ſuch a ſubſtance.

In order to pave the way for his proof of the exiſtence of one uniform active ſubſtance, he obſerves, that "*change* being an eſſentially conſtituent part of motion, and change implying action, it follows that *all motion implies action, and depends on an active cauſe.* Every motion (he continues) has a beginning, a middle, and an end. The beginning is a change from reſt to motion; the middle is a continuance in motion; the end is a change from motion to reſt." He then proceeds to ſhow, that the beginning of motion is by an action begun; the continuance of motion by an action continued; and the end of motion by a ceſſation of action.

"The firſt of theſe poſitions is admitted by every body. That the *continuance* of motion is by an action *continued*, will be proved, if it ſhall be ſhown that the continuance of a motion is nothing different from its beginning, in regard to any point of time aſſumed in the continued motion. Now the beginning of motion (he ſays) conſiſts in the beginning of change of place. But if any given portions of time and of ſpace are aſſumed, a body beginning to move in the commencement of that time, and in the firſt portion of the ſpace aſſumed, then and there begins that particular motion: and whether before the body began to move in that ſpace it was moving in other ſpaces and times, has no relation to the motion in queſtion; for this being in a ſpace and time altogether diſtinct, is a diſtinct motion from any which might have preceded it immediately, as much as from a motion which preceded it a thouſand years before. It is therefore a new motion begun; and ſo it may be ſaid of every aſſumable point in the continued motion. The term *continued* ſerves only to connect any two diſtinct motions, the end of one with the beginning of the other; but does not deſtroy their diſtinctneſs."

He then proceeds to combat, which he does very ſucceſsfully, the arguments by which the more rigid Newtonians endeavour to prove that a body in motion will continue to be moved by its own *inertia*, till ſtopt by ſome oppoſite force. Having done this, he eſtabliſhes the contrary concluſion by the following ſyllogiſms:

"I. Whatever requires an active force to ſtop its motion, is diſpoſed to move.
Every body in motion requires an active force to ſtop its motion:
Therefore every body in motion is diſpoſed to move.
"II. Whatever is diſpoſed to motion is poſſeſſed of action.
But a body in motion is diſpoſed to continue in motion.
Therefore a body in motion is poſſeſſed of action.

Thus it appears, that the middle part of any motion is action equally with the beginning.

"The laſt part of motion is its *termination*. It is admitted that all motion is terminated by an action contrary to the direction of the motion. It is admitted, too, that the moving body *acts* at the time its motion is deſtroyed. Thus the *beginning* and the *end* of any uniform motion are confeſſed to be actions; but all the intermediate *continuation* which connects the beginning with the end is denied to be action. What can be more unaccountable than this denial? Is it not more conſonant to reaſon and analogy, to aſcribe to the whole continued motion one uninterrupted action? Such a concluſion true philoſophy, we think, requires us to make.

"To move or act, is an attribute which cannot be conceived to exiſt without a ſubſtance. The *action of a body in motion* is indeed the attribute of the body, and the body relatively to its own motion is truly a ſubſtance, having the attribute or quality of motion. But the body being a name ſignifying a combination of certain ideas, which ideas are found to ariſe from action (ſee *Plastic Nature*), that action which is productive of thoſe ideas whoſe combination we denominate body, is of the nature of an attribute. In other terms, body is to be conſidered as an attribute ſo long as it is conſidered as conſtituted of action.—To this attribute we muſt neceſſarily aſſign its ſubſtance. The actions which conſtitute body muſt be actions of ſomething, or there muſt be ſomething which acts. What then is this active something from whoſe agency we get the idea of body, or whoſe actions conſtitute body? Is it not ſufficient that it is ſomething active? A name might be ſurely given it, but a name would not render the idea more clear. Its deſcription may be found in every ſenſation; it is colour to the eye, flavour to the palate, odour to the noſe, ſound to the ear, and feeling to the touch; for all our ſenſations are but ſo many ways in which this active something is manifeſted to us. A ſubſtratum of ſolidity philoſophers have imagined to exiſt, and have in vain ſought to find. Our active substance is the ſubſtratum ſo long ſought for, and with ſo little ſucceſs. We give it a quality by which it may be perceived; it acts. One modification of *action* produces matter, another generates motion. Theſe modifications of action are modes of the active ſubſtance, whoſe preſence is action: matter and motion conſtitute the whole of nature. There is therefore throughout nature an active substance, the conſtituent essence of matter, and immediate natural agent in all effects."

14 Which is unintelligent.

By an argument which we do not think very concluſive, our author determines this active ſubſtance to be unintelligent. "In our ſenſations individually, not diſcovering (ſays he) the traces, not ſeeing the characters of intelligence, but finding only action preſent and neceſſary, our inferences go no farther than our obſervations warrant us to do; and we conclude in all theſe things an action only, and that action unintelligent." Having given our opinion of real agency elſewhere (ſee Metaphysics, n° 118.), we ſhall not here ſtop to examine this reaſoning.—We may, however, aſk, Whether all our ſenſation individually be not excited for a *certain end?* If they be, according to our author's mode of arguing in another place, the exciting agent ſhould be an intelligent being. By this we are far from meaning to deny the reality of a ſecondary or inſtrumental cauſe of ſenſation which is deſtitute of intelligence. We are ſtrongly inclined to think that there is ſuch a cauſe, though our perſuaſion reſults not from this argument of our author's. In our opinion, he reaſons better when he ſays, "that a ſubordinate agent conſtructed as the matter of creation, inveſted with perpetual laws, and producing agreeably to thoſe laws all the forms of being, through the varieties of which inferior intelligences can, by progreſſive ſteps, arrive ultimately at the ſupreme contriver, is more agreeable to our ideas of dignity, and tends to impreſs us with more exalted ſentiments, than viewing the Deity directly in all the individual impreſſions we receive, divided in the infinity of particular events, and unawful, by his continual preſence in operations to our view inſignificant and mean."

15 And neither matter nor mind.

This active ſubſtance, or ſecondary cauſe, our author concludes to be neither matter nor mind. "Matter (ſays he) is a being, as a whole quieſcent and inactive, but conſtituted of active parts, which reſiſt ſeparation, or cohere, giving what is uſually denominated ſolidity to the maſs. Mind is a ſubſtance which thinks. A being which ſhould anſwer to neither of theſe definitions, would be neither matter nor mind; but an *immaterial*, and, if I may ſo ſay, an *immental* ſubſtance." Such is the active ſubſtance of Mr Young, which, conſidered as the cauſe of motion, ſeems not to differ greatly from the *plaſtic nature, hylarchical principle*, or *vis genetrix*, of others. The manner in which it operates is indeed much more minutely detailed by our author than by any other philoſopher, ancient or modern, with whoſe writings we have any acquaintance.

"Every thing (he ſays) muſt be in its own nature either diſpoſed to reſt or motion; conſequently the ACTIVE SUBSTANCE muſt be conſidered as a being naturally either quieſcent or motive. But it cannot be naturally quieſcent; for then it could not be active, becauſe activity, which is a tendency to motion, cannot originate in a tendency to reſt. Therefore the
16 The manner in which it is ſuppoſed to operate,
ACTIVE SUBSTANCE is by nature motive, that is, tending to motion. The ACTIVE SUBSTANCE is not ſolid, and does not reſiſt penetration. It is therefore incapable of impelling or of ſuſtaining impulſe. Whence it follows, that as it tends to move, and is incapable of having its motion impeded by impulſe, it muſt actually and continually move: in other words, MOTION IS ESSENTIAL TO THE ACTIVE SUBSTANCE.

"In order that this ſubſtance may *act*, ſome other thing upon which it may produce a change is neceſſary; for whatever ſuffers an action, receives ſome change. The active ſubſtance, in acting on ſome other thing, muſt impart and unite itſelf thereto; for its *action* is communicating its *activity*. But it cannot communicate its activity without imparting its ſubſtance; becauſe it is the ſubſtance alone which poſſeſſes activity, and the quality cannot be ſeparated from the ſubſtance. THEREFORE THE ACTIVE SUBSTANCE ACTS BY UNITING ITSELF WITH THE SUBSTANCE ON WHICH IT ACTS. The union of this ſubſtance with bodies, is not to be conceived of as a junction of ſmall parts intimately blended together, and attached at their ſurfaces; but as an entire diffuſion and incorporation of one ſubſtance with another in perfect coaleſcence. As bodies are not naturally active, whenever they become ſo, as they always do in motion, it muſt be by the acceſſion of ſome part of the active ſubſtance. The active ſubſtance being imparted to a body, penetrates the moſt ſolid or reſiſting parts, and does not reſide in the pores without, and at the ſurfaces of the ſolid parts. For the activity is imparted to the body itſelf; and not to its pores, which are no parts of the body: therefore, if the active ſubſtance remained within the pores, the cauſe would not be preſent with its effect; but the cauſe would be in one place and the effect in another, which is impoſſible.

Bodies by their impulſe on others loſe their activity in proportion to the impulſe. This is matter of obſervation. Bodies which ſuffer impulſe acquire activity in proportion to the impulſe. This alſo is matter of obſervation. In impulſe, therefore, the active ſubſtance paſſes out of the impelling body into the body impelled. For ſince bodies in motion are active, and activity conſiſts in the preſence of the active ſubſtance, and by impulſe bodies loſe their activity, therefore they loſe their active ſubſtance, and the loſs is proportional to the impulſe. Bodies impelled acquire activity; therefore acquire active ſubſtance, and the acquiſition is proportioned to the impulſe. But the active ſubſtance loſt by the impelling body ought to be concluded to be that found in the other; becauſe there is no other receptacle than the impelled body to which the ſubſtance parted from can be traced, nor any other ſource than the active body whence that which is found can be derived. Therefore, in impulſe, the active ſubſtance ought to be concluded to paſs from the impelling body to the body impelled. The flowing of ſuch a ſubſtance is a ſufficient cauſe of the communication of activity, and no other rational cauſe can be aſſigned.

"The continued motion of a body depends not upon its *inertia*, but upon the continuance of the active ſubſtance within the body. The motion of a body is produced by the motion of the active ſubſtance in union with the body. It being evident, that ſince the active ſubſtance itſelf does always move, whatever it is united to will be moved along with it, if no obſtacle prevent. In mere motion, the body moved is the patient, and the active ſubſtance the agent. In impulſe, the body in motion may be conſidered as an agent, as it is made active by its active ſubſtance.—While the active ſubſtance is flowing out of the active body into the obſtacle or impelled body, the active body will preſs or impel the obſtacle. For while the active ſubſtance is yet within the body, although flowing through it, it does not ceaſe to impart to the body its own nature, nor can the body ceaſe to be active, becauſe not yet deprived of the active ſubſtance. Therefore, during its paſſing out of the body, ſuch portion of the active ſubſtance as is yet within, is urging and diſpoſing the body to move, in like manner as if the active ſubſtance were continuing in the body; and the body being thus urged to move, but impeded from moving, preſſes or impels the obſtacle.
17 produce impulſe,
"We ſee here (ſays our author) an obvious explanation of impulſe; it conſiſts in the flowing of the motive ſubſtance from a ſource into a receptacle:" and he thinks, that although the exiſtence of ſuch a ſubſtance had not been eſtabliſhed on any previous grounds, the communication of motion by impulſe does alone afford a ſufficient proof of its reality.

He employs the agency of the ſame ſubſtance to account for many other apparent activities in bodies, ſuch as thoſe of *fire, electricity, attraction, repulſion, elaſticity*, &c. All the apparent origins of corporeal activity, ſerve (he ſays) to impart the active ſubſtance to bodies; "and where activity is without any *manifeſt* origin, the active ſubſtance is derived from an inviſible ſource."

Our limits will not permit us to attend him in his ſolution of all the apparent activities in bodies; but the orbicular motions of the planets have been accounted for in ſo many different ways by philoſophers ancient and modern, and each account has been ſo little ſatisfactory to him who can think, and wiſhes to trace effects from adequate cauſes, that we conſider it as our duty to furniſh our readers with the account of this phenomenon which is given by Mr Young.
18 and cauſe the motion of the heavenly bodies.
The queſtion which has been ſo long agitated, "Whence is the origin of motion?" our author conſiders as implying an abſurdity. "It ſuppoſes (ſays he) that reſt was the primitive ſtate of matter, and that motion was produced by a ſubſequent act. But this ſuppoſition muſt ever be rejected, as it is giving precedency to the inferior, and inverting the order of nature." The ſubſtance which he holds to be the baſis

baſis of matter is eſſentially active; and its action is motion. This motion, however, in the original element, was *power* without direction, agency without order, activity to no end. To this power it was neceſſary that a LAW ſhould be ſuperadded; that its agency ſhould be guided to ſome regular purpoſe, and its motion conſpire to the production of ſome uniform effects." Our author ſhows, or endeavours to ſhow, by a proceſs of reaſoning which ſhall be examined elſewhere, that the primary atoms of matter are produced by the circular motion of the parts of this ſubſtance round a centre; and that a ſimilar motion of a number of theſe atoms round another centre common to them all, produces what in common language is called a *ſolid body;* a cannon ball, for inſtance, the terreſtrial globe, and the body of the ſun, &c. In a word he labours to prove, and with no ſmall ſucceſs, that a principle of union is implied in the revolving or circulating movements of the active ſubſtance.

"But we may alſo aſſume (he ſays) *à priori*, that a principle of union is a general law of nature; becauſe we ſee in fact all the component parts of the univerſe are united ſyſtems, which ſucceſſively combine into larger unions, and ultimately form *one* whole." Let us then ſuppoſe the ſun with all his planets, primary and ſecondary, to be already formed for the purpoſe of making one ſyſtem, and the orbits of all of them, as well as theſe great bodies themſelves, to be prevaded by the active ſubſtance, which neceſſarily exiſts in a ſtate of motion, and is the cauſe of the motion of every thing corporeal. "If to this motion a principle of union be added, the effect of ſuch a principle would be a determination of all the parts of the active ſubſtance, and of courſe all the bodies to which it is united, towards a common centre, which would be at reſt, and void of a tendency in any direction. But this determination of all the parts of the ſyſtem towards a common centre, tends to the deſtruction both of the motion of the active ſubſtance and of the ſyſtem; for ſhould all the parts continually approximate from a circumference towards a centre, the ſun and planets would at laſt meet, and form one ſolid and quieſcent maſs. But to preſerve exiſtence, and conſequently motion, is the firſt law of the active ſubſtance as of all being; and it cannot be doubted, that to preſerve diſtinct the ſeveral parts of the ſolar ſyſtem, is the firſt law given to the ſubſtance actuating that ſyſtem. The union of the ſyſtem is a ſubſequent law.

"When the *direct* tendency of any inferior law is obviated by a higher law, the inferior law will operate *indirectly* in the manner the neareſt to its direct tendency that the ſuperior law will permit. If a body in motion be obliquely obſtructed, it will move on in a direction oblique to its firſt motion. Now the law of union, which pervades the ſolar ſyſtem, being continually obſtructed by the law of ſelf-preſervation, the motion of the active ſubſtance and of the bodies to which it is united can be no other than a revolving motion *about* the common centre of approach, *towards* which all the parts have a determination. But when this revolution has actually taken place, it gives birth to a new tendency, which ſuperſedes the operation of the law of ſelf-preſervation. It has been ſhown, that the motion eſſential to the active ſubſtance, required to be governed by ſome law to give being to an orderly ſtate of things. Now, there are motions ſimple and motions complex; the more ſimple is in all things firſt in order, and out of the more ſimple the more complex ariſes in order poſterior. The moſt ſimple motion is rectilineal; therefore a rectilineal motion is to be conſidered as that which is the original and natural ſtate of things and conſequently that to which *all things tend*. It will follow from hence, that when any portion of active ſubſtance in which the *law of union* operates, has in the manner above explained been compelled to aſſume a revolving motion, that is, a motion in ſome curve; a tendency to a rectilineal motion will continually exiſt in every part of the revolving portion, and in every point of the curve which it deſcribes during its revolution. And this rectilineal tendency will be a tendency to recede from the centre in every point of the revolving orbit, and to proceed in a tangent to the orbit of each point. Theſe two tendencies, if not originally equal, muſt neceſſarily in all caſes arrive at an equality. For the tendency towards the centre, called the *centripetal* tendency, that is the *law of union*, operating firſt, if we ſuppoſe the motion approaches the centre, the tendency to recede from it called the *centrifugal* tendency, will have its proportion to the centripetal continually increaſed as the orbit of revolution grows leſs, ſo as ultimately to equal the centripetal tendency, and reſtrain the motion from its central courſe, at which point it will no longer ſeek the centre but revolve round it."

As our author holds that every atom of matter is formed by the motion of parts of the active ſubſtance, and every body formed by the motion of atoms; ſo he maintains, not only that the ſun, moon, earth, planets and ſtars, are penetrated by the ſame ſubſtance, but that each is the centre of a vortex of that ſubſtance and that of theſe vortices ſome are included within others. "The ſubtile revolving fluid, the centre of whoſe vortex the earth occupies, not only ſurrounds but prevades the earth, and other vortices their earths, to their centres; and the earth and planets are by its revolutions carried around on their own axes. The earth is an inactive maſs, and all its component maſſes are ſeverally as well as collectively inactive; but the earth and all its parts have various collective and ſeparate movements, imparted from the fluid which ſurrounds, pervades, and conſtitutes it. Being immerſed together with its proper ſurrounding ſphere or vortex, in the larger ſphere or vortex of the ſun, it is carried thereby in a larger orbit about the ſun, at the ſame time that by the revolution of its proper ſphere it rotates on its own axis."

19 Objections to this theory.

Such is the moſt complete view which our limits will permit us to give of Mr Young's theory of motion. To the philoſopher who conſiders experiment as the only teſt of truth, and who in all his inquiries employs his hands more than his head, we are fully aware that it will appear in no better light than as "the baſeleſs fabric of a viſion." Even to the intellectual philoſopher who is not frightened at the word *metaphyſics*, we are afraid than ſuch an active ſubſtance as the author contends, for, will appear as inadequate to the production of the phenomena of gravitation and repulſion as the material æther of Mr Jones and his followers. A being void of intelligence, whether it be material or immaterial, quieſcent or motive, cannot be the ſubject of law, in the proper ſenſe of the word. The laws of which Mr Young ſpeaks as neceſſary to regulate the motions of the active ſubſtance, muſt be mere *forces*, applied by ſome extrinſic and ſuperior power. And ſince "motion, as it is *eſſential* to the active ſubſtance, is power without direction, agency without order, activity to no end; ſince it is of ſuch a nature, that from its unguided agitations there could reſult neither connection, order, nor harmony;" it follows that thoſe extrinſic forces muſt be perpetually applied, becauſe what is *eſſential* to any ſubſtance can never be deſtroyed or changed ſo long as the ſubſtance itſelf remains.

Forces producing order out of confuſion, can be applied only by a being poſſeſſed of intelligence; and if the immediate and perpetual agency of an intelligent being be neceſſary to regulate the motions of the active ſubſtance, that ſubſtance itſelf may be thought ſuperfluous, and its very exiſtence be denied. *Entia non ſunt multiplicanda abſque neceſſitate*, is a rule of philoſophiſing which every man of ſcience acknowledges to be juſt. And it will hardly be denied, that the immediate and perpetual agency of an intelligent being upon Mr Jones's ætherial fluid, or even upon the matter of ſolid bodies themſelves, would be capable of producing every kind of motion without the inſtrumentality of a ſubſtance which is neither mind nor matter.

Such we conceive, are the objections which our metaphyſical readers may make to this theory. Part of their force, however, will perhaps be removed by the ingenious manner in which our author analyſes matter into an immaterial principle. But ſo much of it remains, that the writer of this article is inclined to believe that no mechanical account can be given of the motions of the heavenly bodies, the growth of plants, and various other phenomena which are uſually ſolved by attraction and repulſion. In the preſent age, philoſophers in general are ſtrangely averſe from admittting on any occaſion the agency of mind; yet as every effect muſt have a cauſe, it is ſurely not irrational to attribute ſuch effects as mechaniſm cannot produce to the operation either of intelligence or inſtinct. To ſuppoſe the Deity the immediate agent in the great motions of the univerſe, has been deemed impious; and it muſt be confeſſed that very impious concluſions have been deduced from that principle. But there is ſurely no impiety in ſuppoſing, with the excellent biſhop of Cloyne, that the fluid which is known to pervade the ſolar ſyſtem, and to operate with reſiſtleſs force, may be animated by a powerful mind, which acts inſtinctively for ends of which itſelf knows nothing. For the exiſtence of ſuch a mind, no other evidence, indeed, can be brought than what is afforded by a very ancient and very general tradition, and by the impoſſibility of accounting for the phenomena upon principles of mere mechaniſm. Perhaps ſome of our more pious readers may be inclined to think that the Supreme Being has committed the immediate government of the various planetary ſyſtems to powerful *intelligences*, or ANGELS, who as his miniſters, direct their motions with wiſdom and foreſight. Such an opinion is certainly not abſurd in itſelf; and it ſeems to be countenanced by an ancient writer* who, though not known by the name of a philoſopher, knew as much of the matter as any founder of the moſt celebrated ſchool.

20
Other theories more ancient and rational.

To object to either of theſe hypotheſes, as has been ſometimes done, that it repreſents the government of the world as a perpetual miracle, betrays the groſſeſt ignorance; for we might as well call the movements of the bodies of men and brutes, which are certainly produced by minds, miraculous. We do not affirm that either hypotheſis is certainly true; but they are both as probable and as ſatisfactory as the hypotheſis which attributes agency to attraction and repulſion, to a ſubtile æther, or to a ſubſtance which is neither a mind nor matter. Were the immediate agency of intellect to be admitted there would be no room for many of thoſe diſputes which have been agitated among philoſophers, about the increaſe or diminution of motions in the univerſe; becauſe an intelligent agent, which could begin motion as well as carry it on, might increaſe or diminiſh it as he ſhould judge proper. If inſtinctive agency, or ſomething ſimilar to it, be adopted, there is the ſame room for inveſtigation as upon, the principles of mechaniſm; becauſe inſtinct works blindly according to ſteady laws impoſed by a ſuperior mind, which may be diſcovered by obſervation of their effect As we conſider this as by much the moſt probable hypotheſis of the two, we find ourſelves involved in the following queſtion: "If a certain quantity of motion was originally communicated to the matter of the univerſe, how comes it to paſs that the original quantity ſtill remains: Conſidering the many oppoſite and contradictory motions which ſince the creation have taken place in the univerſe, and which have undoubtedly deſtroyed a great part of the original quantity, by what means has that quantity been reſtored?

21
The queſtion Whether the original quantity of motion in the world remains unimpaired? anſwered by

If this queſtion can be ſolved by natural means, it muſt be upon the principles of Newton; for "in every caſe § where quantities and relations of quantities are required, it is the province of mathematics to ſupply the information ſought," and all philoſphers agree that Sir Iſaac's doctrine of the compoſition and reſolution of motion, though in what reſpects the heavenly bodies it may have no phyſical reality, is ſo mathematically juſt, as to be the only principle from which the quantity of motion, or the force of powers, can in any caſe be computed. If we chooſe to anſwer the queſtion, by ſaying that the motion left is reſtored by the interpoſition of the Deity, then we might as well have had recourſe to him at firſt, and ſay that he alone is the true principle of motion throughout the creation.

22
The Carteſians, and

Before, we are reduced to this delemma, however, it is neceſſary, in the firſt place, to inquire whether there is or can be any real diminution of the quantity of motion throughout the univerſe? In this queſtion the Carteſians take the negative ſide; and maintain that the Creator at the beginning impreſſed a certain quantity of motion on bodies, and that under ſuch laws as that no part of it ſhould be loſt, but the ſame portion of motion ſhould be conſtantly preſerved in matter: and hence they conclude, that if any moving body ſtrike on any other body, the former loſes no more of its motion than it communicates to the latter. Sir Iſaac Newton takes the contrary ſide, and argues in the following manner: "From the various compoſitions of two motions, it is manifeſt there is not always

23
By Newton.

*Pſal. 104.

§ Young's Eſſay on the Powers and Mechaniſm, &c.

ways the ſame quantity of motion in the world; for if two balls, joined together by a ſlender wire, revolve with an uniform motion about their common centre of gravity, and at the ſame time that centre be carried uniformly in a right line drawn in the plane of their circular motion, the ſum of the motions of the two balls, as often as they are in a right line, drawn from their common centre of gravity, will be greater than the ſum of their motions when they are in a line perpendicular to that other. Whence it appears, that motion may be both generated and loſt. But, by reaſon of the tenacity of fluid bodies, and the friction of their parts, with the weakneſs of the elaſtic power in ſolid bodies, nature ſeems to incline much rather to the deſtruction than the production of motion; and in reality, motion becomes continually leſs and leſs.—For bodies which are either ſo perfectly hard or ſo ſoft as to have no elaſtic power, will not rebound from each other; their impenetrability will only ſtop their motion. And if two ſuch bodies equal to one another be carried with equal but oppoſite motions, ſo as to meet in a void ſpace, by the laws of motion they muſt ſtop in the very place of concourſe, loſe all their motion, and be at reſt for ever, unleſs they have an elaſtic power to give them a new motion. If they have elaſticity enough to make them rebound with one-fourth, one-half, or three-fourths, of the force they meet with, they will loſe three-fourths, one-half, or one-fourth, of their motion. And this is confirmed by experiments: for if two equal pendulums be let fall from equal heights, ſo as to ſtrike full upon each other; if thoſe pendulums be of lead or ſoft clay, they will loſe all, or almoſt all, their motion; and if they be of any elaſtic matter, they will only retain ſo much motion as they receive from their elaſtic power."

Motion, therefore, being thus, in the opinion of our celebrated author, *loſt*, or, *abſolutely deſtroyed*, it is neceſſary to find ſome cauſe by which it may be renewed. Such renovation Sir Iſaac attributes to *active* principles; for inſtance, "the cauſe of gravity, whereby the planets and comets preſerve their motions in their orbits, and all bodies acquire a great degree of motion in falling; and the cauſe of fermentation, whereby the heart and blood of animals preſerve a perpetual warmth and motion, the inner parts of the earth are kept perpetually warmed: many bodies burn and ſhine, and the ſun himſelf burns and ſhines, and with his light warms and cheers all things."

Elaſticity is another cauſe of the renovation of motion mentioned by Sir Iſaac. "We find but little motion in the world (ſays he), except what plainly flows either from theſe active principles, or from the command of the willer.

24 No power of motion ever loſt or deſtroyed.

With regard to the *deſtruction* or poſitive *loſs* of motion, however, we muſt obſerve, that notwithſtanding the authority of Sir Iſaac Newton, it is altogether impoſſible that any ſuch thing can happen. All moving bodies which come under the cognizance of our ſenſes are merely paſſive, and acted upon by ſomething which we call *power*, or *ſpirit*, and which are to us totally inviſible. Motion, thererefore, cannot be loſt without a deſtruction or diminution of one of theſe *powers*, which we have no reaſon to think can ever happen. When two pendulums fall againſt each other, the motion is the mere effect of the power of gravity; and that action, which in this caſe is the *power*, continues to be the very ſame whether the pendulum moves or moves not. Could reaſon therefore, be exhauſted in this caſe, we muſt ſuppoſe, that by ſeparating two pendulums to the ſame diſtance from each other, and then letting them come together for a great number of times, they would at laſt meet with leſs force than before. But there is certainly not the leaſt foundation for this ſuppoſition; and no rational perſon will take it into his head, that ſuppoſing the whole human race had employed themſelves in nothing elſe from the creation to the preſent day, but ſeparating pendulums and letting them ſtop each other's motion, they would now come together with leſs force than they did at firſt. *Power*, therefore which is the cauſe of motion, is abſolutely indeſtructible. Powers may indeed counteract one another, or they may be made to counteract themſelves; but the moment that the obſtacle is removed, they ſhow themſelves in their priſtine vigour, without the leaſt ſymptom of abatement or decay.

25 [illegible] of Sir Iſaac Newton's doctrine of the compoſition and reſolution of motion. Plate CCCX[illegible].

Under the article MECHANICS, it has been ſhown, that when motion is compounded of two powers acting obliquely upon one another, more motion is loſt than the two powers taken together could ſpare. Thus, if the two powers AB and AC move a body through the diagonal of the ſquare AD; ſuppoſing each of theſe powers to be = 5, the diagonal through which they paſs will be 7 (A); but from an inſpection of the figure, it is manifeſt, that by the ſeparation of the two powers, a quantity of motion BC, equal to the length of the other diagonal, is loſt; for in as far as the two act oppoſite to each other, they muſt deſtroy motion. The quantity of motion produced therefore being 7, and the quantity loſt the ſame, the whole quantity originally exiſting in the two powers AB and BC ought to have been 14, when it is only 10. To make up for the deficiency therefore, we muſt ſearch for the origin of the two powers AB and BC, and this we ſhall find in the lines A*a*, A*c*, and A*d*; each of which is $3\frac{1}{2}$, altogether making 14; whence deducting 7 the motion loſt, we have 7 remaining for the motion produced. Let us now find out the origins of theſe powers, and we ſhall find thoſe of A*a* in the lines A*e* and A*f*; the origins of A*c* in A*f* and A*g*. The ſources of A*d* we find in the lines A*g* and A*h*. Thus we have now eight ſources of the four powers which generated the two firſt ones; and thus we find that the power AD = 7. requires two of 5 each = 10 for its generation; theſe two require four of $3\frac{1}{2}$ each for their production; and theſe again require eight of 2. 45 each for their production. Hence, in order to generate the two original powers AB and AC, we ſee that there is required at a very few ſteps no leſs than 20; and in like manner, to generate theſe eight powers, we muſt have recourſe to 16 others; ſo that the ultimate ſource of motion increaſes beyond all calculation.

Whether, therefore, we reckon the ultimate ſource of motion to be ſpiritual or material, it is plain that it muſt be to our conceptions *infinite*; neither will the phe-

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(A) It will be ſomething more than 7; but the fractional part is omitted, as being of no importance in the illuſtration of the fact before us.

phenomena of nature allow us to give any other explanation than we have done: for no power whatever can loſe more than its own quantity; and it ſeems abſurd to think that the Deity would create the world in ſuch a manner that it would ultimately become immoveable, and then have recourſe to unknown principles to remedy the ſuppoſed defect. On the principle we have juſt now laid down, however, the matter becomes exceedingly plain and obvious. The creator at firſt formed two oppoſite powers, the action of which is varied according to the circumſtances of the bodies upon which they act; and theſe circumſtances are again varied by the action of the powers themſelves in innumerable ways upon one another, and the approach of one body to another, or their receding to a greater diſtance. Where theſe powers happen to oppoſe each other directly, the body on which they act is at reſt; when they act obliquely, it moves in the diagonal; or if the force acting upon one ſide is by any means leſſened, the body, certainly muſt move towards that ſide, as is evident from the caſe of the atmoſphere, the preſſure of which, when removed from one ſide of a body, will make it move very violently towards that ſide; and if we could continually keep off the preſſure in this manner, the motion would aſſuredly be *perpetual.* We muſt not imagine that motion is *deſtroyed* becauſe it is *counteracted;* for it is impoſſible to deſtroy motion by any means but by removing the cauſe; counteracting the effect is only a temporary obſtacle, and muſt ceaſe whenever the obſtacle is removed. Nature, therefore, having in itſelf an *infinite* quantity of motion, produces greater or leſſer motions, according to the various actions of the moving powers upon different bodies or upon one another, without a poſſibility of the general ſtock being either augmented or diminiſhed, unleſs one of the moving powers was to be withdrawn by the Creator; in which caſe, the other would deſtroy the whole ſyſtem in an inſtant. As to the nature of theſe great original powers, we muſt confeſs ourſelves totally ignorant; nor do we perceive any data from which the nature of them can be inveſtigated. The elements of light, air, &c. are the agents; but in what mannner they act, or in what manner they received their action, can be known only to the Creator.

26
The nature of the moving powers unknown.

Perpetual Motion, in mechanics, a motion which is ſupplied and renewed from itſelf, without the intervention of any external cauſe; or it is an uninterupted communication of the ſame degree of motion from one part of matter to another, in a circle or other curve returning into itſelf, ſo that the ſame momentum ſtill returns undiminiſhed upon the firſt mover.

The celebrated problem of a perpetual motion conſiſts in the inventing a machine, which has the principle of its motion within itſelf. M. de la Hire has demonſtrated the impoſſibility of any ſuch machine, and finds that it amounts to this; *viz.* to find a body which is both heavier and lighter at the ſame, or to find a body which is heavier than itſelf.

To find a perpetual motion or to conſtruct an engine, &c. which ſhall have ſuch a motion, is a famous problem that has employed the mathematicians of 2000 years; though none perhaps have proſecuted it with attention and earneſtneſs equal to thoſe of the preſent age. To relate all the ſchemes, deſigns, plans, engines, wheels, &c. to which this longed for perpetual motion has given birth; it were as endleſs as impertinent to give a detail of them all.

In effect, there ſeems but little in nature to countenance all this aſſiduity and expectation; among all the laws of matter and motion, we know of none yet which ſeems to furniſh any principle or foundation for ſuch an effect.

Animal Motion, that which is performed by animals at the command of the mind or will.

Though all the motions of animals, whether voluntary or involuntary, are performed by means of the muſcles and nerves, yet neither theſe nor the ſubtile fluid which reſides in them are to be accounted the ultimate ſources of animal motion. They depend entirely upon the mind for thoſe motions which are properly to be accounted *animal.* All the involuntary motions, ſuch as thoſe of the blood, the heart, muſcles, organs ſubſervient to reſpiration and digeſtion, &c. are to be claſſed with thoſe of vegetables; for though no vegetable have them in ſuch perfection as animals, there are yet traces of them to be found evidently among vegetables, and that ſo remarkably, that ſome have imagined the animal and vegetable kingdoms to approach each other ſo nearly that they could ſcarce be diſtinguiſhed by a philoſophic eye. See Muscle.

Though the motions of animals, however, depend on the action of the mind or of the will, external objects ſeem originally to have the command of the mind itſelf; for unleſs an animal perceive ſomething, it will not be inclined to act. By means of the ideas once received, indeed, and retained in the memory, it acquires a ſelf-moving power, independent of any object preſent at the time, which is not the caſe with vegetables; for however they may act from a preſent impulſe, their motions never appear to be derived from any ſource which may not be accounted ſtrictly mechanical.

According to ſome, motion is the cauſe of ſenſation itſelf; and indeed it ſeems very probable that the motions of that ſubtile fluid, called *light* or *electricity*, in our bodies always acompany our ſenſation; but whether theſe be the *cauſe*, or only the *medium*, of ſenſe, cannot be diſcovered.

Though all animals are endowed with a power of voluntary motion, yet there is a very great variety in the degrees of that power; to determine which no certain rules can be aſſigned; neither can we, from the ſituation and manner of life of animals, derive any probable reaſon why the motion of one ſhould differ ſo very much from that of another. This difference does not ariſe from their ſize, their ferocity, their timidity, nor any other property that we can imagine. The elephant though the ſtrongeſt land animal, is by no means the ſloweſt in its motions; the horſe is much ſwifter than the bull, though there is not much difference in their ſize; a grey-hound much ſwifter than a cat, though the former be much larger, and though both live in the ſame manner, *viz.* by hunting. Among inſects the ſame unaccountable diverſity is obſervable. The louſe and flea are both vermin, are both nearly of the ſame ſize, and both feed on the bodies of animals; yet there is no compariſon between the ſwiftneſs of their motions: while the bug which is much larger than either, ſeems to have a kind of medium ſwiftneſs between both.—This very remarkable circumſtance ſeems not even to depend on the range which animals are obliged to take in order to procure food for themſelves: the motion of a ſnail is ſlower than that of an earth-worm; while that of many caterpillars is much quicker than either; though we can ſcarce determine which of the three has the greateſt or the leaſt extenſive range for its food.

Of all animals the ſhell-fiſh move the ſloweſt, inſomuch that ſome have ſuppoſed them to be entirely deſtitute of loco-motive powers; and muſcles particularly are denied to have any faculty of this kind. Every one knows that theſe animals can open and ſhut their ſhells at pleaſure; and it cannot eſcape obſervation, that in every muſcle there is a fleſhy protuberance of a much redder colour than the reſt. This has been thought to be a tongue or proboſcis, by which the animal takes in its food; but is in reality the inſtrument of its motion from place to place. This protuberance is divided into two lobes, which perform the office of feet. When the river muſcle is inclined to remove from its ſtation, it opens its ſhell, thruſts out this protuberance, and digs a furrow in the ſand; and into this furrow, by the action of the ſame protuberance, the ſhell is made to fall in a vertical poſition. It is recovered out of this into the former horizontal one, by puſhing back the ſand with the ſame tentacula, lengthens the furrow, and thus the animal continues its journey by a continual turning topſy-turvy.—Marine muſcles perform their motions in the ſame manner, and by ſimilar inſtruments. In general they are firmly attached to rocks or ſmall ſtones by threads about two inches long, which are ſpun from a glutinous ſubſtance in the protuberances already mentioned; theſe are called, in Scotland, the *beards* of muſcles, and are thought to be the cauſe of the fatal diſorders which ſometimes attend the eating of muſcles. See Mytulus.

Other animals which dwell in bivalved ſhells, perform their motions by a kind of leg or foot; which, however, they can alter into almoſt any figure they pleaſe. By means of this leg they can not only ſink into the mud, or riſe out of it at pleaſure, but can even leap from the place where they are; and this can be done by the limpit, which people are apt to imagine one of the moſt ſluggiſh animals in nature.—When this creature is about to make a ſpring, it ſets its ſhell on edge, as if to to diminiſh friction; then, ſtretching out the leg as far as poſſible, it makes it embrace a portion of the ſhell, and by a ſudden movement, ſimilar to that of a ſpring let looſe, it ſtrikes the earth with its leg, and actually leaps to a conſiderable diſtance.

The ſpout, or razor-fiſh, is ſaid to be incapable of moving forward horizontally on the ſurface; but it digs a hole ſometimes two feet deep in the ſand, in which it can aſcend or deſcend at pleaſure. The leg, by which it performs all its movements, is fleſhy, cylindrical, and pretty long; and the animal can at pleaſure make it aſſume the form of a ball. When lying on the ſurface of the ſand, and about to ſink into it, the leg is extended from the inferior end of the ſhell, and makes the extremity of it take on the form of a ſhovel, ſharp on each ſide, and terminating in a point. With this inſtrument the animal makes a hole in the ſand; after which it advances the leg ſtill farther into it, makes it aſſume the form of a hook, and with this, as a fulcrum, it obliges the ſhell to deſcend into the hole. This operation is continued until the whole ſhell be covered; and when the animal wiſhes to regain the ſurface, it makes the extremity of the leg to aſſume the form of a ball, and makes an effort to extend it. The ball, however, prevents any farther deſcent, and the re-action of the muſcular effort raiſes up the whole ſhell, which operation is continued until it reaches the ſurface; and it is ſurpriſing with what facility theſe motions are accompliſhed by an animal ſeemingly ſo little qualified to move at all. Another particularity in this fiſh is, that though it lives among ſalt water, it abhors ſalt ſo much that when a little is thrown into its hole it inſtantly leaves it. But it is ſtill more remarkable, that if you once take hold of the ſpout fiſh, and then allow it to retire into its hole, it cannot then be driven out by ſalt; though unleſs it be taken hold of by the hand, the application of ſalt will make it come to the ſurface as often as you pleaſe. See Solen.

All other ſhell-fiſh, even thoſe apparently the moſt ſluggiſh and deſtitute of any apparatus for motion, are found to be furniſhed with ſuch inſtruments as enable them to perform all thoſe movements for which they have any occaſion. Thus the ſcallop, a well-known animal inhabiting a bivalved ſhell, can both ſwim upon the ſurface of water and move upon land. When it happens to be deſerted by the tide, it opens its ſhell to the full extent, and ſhutting it again with a ſudden jerk, the reaction of the ground gives ſuch an impulſe to the whole, that it ſometimes ſprings five or ſix inches from the ground; and by a continued repetition of this action, it gradually tumbles forward until it regains the water. Its method of ſailing is ſtill more curious. Having attained the ſurface of the water by means unknown to us, it opens the ſhell, and puts one half above water, the other with the body of the animal in it, remaining below. Great numbers of them are thus frequently ſeen ſailing in company with their ſhells ſticking up above water when the weather is fine, and the wind acting upon them as ſails; but on the leaſt alarm they inſtantly ſhut their ſhells, and all ſink to the bottom together. See Pecten.

The oyſter has generally been ſuppoſed one of the moſt ſluggiſh animals in nature, and totally incapable of voluntary motion; but from the reſearches of the Abbé Dicquemarre, this opinion ſeems to be erroneous. The oyſter, like many other bivalved ſhell-fiſh, has a power of ſquirting water out from its body; and this property may eaſily be obſerved by putting ſome of them into a plate with as much ſea-water as will cover them. The water is ejected with ſo much force, as not only to repel the approach of ordinary enemies, but to move the whole animal backwards or ſideways, in a direction contrary to that in which the water was ejected. It has been alſo ſuppoſed, that oyſters are deſtitute of ſenſation; but M. Dicquemarre has ſhown, that they not only poſſeſs ſenſation, but that they are capable of deriving knowledge from experience. When removed from ſuch places as are entirely covered with the ſea, when deſtitute of experience, they open their ſhells and die in a few days; but if they happen to eſcape this danger, and the water covers them again, they will not open their ſhells again, but keep them ſhut, as if warned by experience to avoid a danger ſimilar to what they formerly underwent. See Ostrea.

The motions of the ſea-urchin are perhaps more curious and complicated than thoſe of any other animal. It inhabits a beautiful multivalved ſhell, divided into triangular compartments, and covered with great numbers of prickles; from which laſt circumſtance it receives the name of *ſea-urchin* or *ſea hedge-hog*. The triangles are ſeparated from one another by regular belts, and perforated by a great number of holes, from every one of which iſſues a fleſhy horn ſimilar to that of a ſnail, and capable of moving in a ſimilar manner. The principal uſe of theſe horns ſeems to be to fix the animal to rocks or ſtones, though it likewiſe makes uſe of them in its progreſſive motion. By means of theſe horns and prickles, it is enabled to walk either on its back or its belly; but it moſt commonly makes uſe of thoſe which are near the mouth. Occaſionally it has a progreſſive motion by turning round like a wheel. Thus, ſays Mr Smellie‡, the ſea-urchin furniſhes an example of an animal employing many thouſand limbs in its various movements. The reader may try to conceive the number of muſcles, fibres, and other apparatus which are requiſite to the progreſſive motion of this little animal.

Thoſe animals called *ſea-nettles* or *urticæ*, though extremely ſlow in their motions, are nevertheleſs evidently capable of moving at pleaſure from place to place. The variety of their figure is ſuch, that it is difficult to aſſign them any determinate figure whatever. In general, however, they reſemble a truncated cone, the baſe of which is applied to the rock to which they adhere. Their colours are various, whitiſh, brown, red, or greeniſh: the mouth is very large; and when opened appears ſurrounded with filaments reſembling the horns of ſnails, which being diſpoſed in three rows around it, give the animal the appearance of a flower*; and through every one of theſe the animal has the power of ſquirting the ſea-water. The ſtructure of theſe animals is extremely ſingular; they conſiſting all of one organ, *viz.* a ſtomach. When ſearching for food, they extend their filaments, and quickly entangle any ſmall animals that come within their reach. The prey is inſtantly ſwallowed, and the mouth ſhut cloſe upon it like a purſe; in which ſtate it remains for many days before the nutritive parts are extracted. The animal, though ſcarcely an inch or an inch and a half in diameter, is nevertheleſs ſo dilatable, that it can ſwallow large whelks and muſcles, the ſhells of which are thrown out by the mouth after the nutritive parts have been exhauſted. Sometimes the ſhell is too large to be voided this way; in which caſe the body of the animal ſplits, and the ſhell is voided through the opening, which in a ſhort time heals up again. The progreſſive motion of this creature is ſo ſlow, that it reſembles that of the hour-hand of a clock, and is performed by means of innumerable muſcles placed on the outſide of the body. All theſe are tubular and filled with a fluid, which makes them project like prickles. On occaſion it can likewiſe looſen the baſe of the cone from the rock, and inverting its body move by means of the filaments already mentioned, which ſurround the mouth; but even the motion performed in this manner is almoſt as ſlow as the other.

Some animals are capable of moving backwards, apparently with the ſame facility that they do forwards, and that by means of the ſame inſtruments which move them forward. The common houſe-fly exhibits an inſtance of this, and frequently employs this retrograde motion in its ordinary courſes; though we cannot know the reaſon of its employing ſuch an extraordinary method. Another remarkable inſtance is given by Mr Smellie in the *maſon-bee*. This is one of the ſolitary ſpecies, and has its name from the mode of conſtructing its neſt with mud or mortar. Externally this neſt has no regular appearance, but at firſt ſight is taken for a quantity of dirt adhering to the wall, though the internal part be furniſhed with cells in the ſame regular manner with the neſts of other inſects of the bee-kind. When this bee leaves its neſt, another frequently takes poſſeſſion of it; in which caſe a battle never fails to enſue on the return of the real proprietor. The diſpute is decided in the air; and each party endeavours to get above the other, as birds of prey are wont to do in order to give a downward blow. The undermoſt one, to avoid the ſtroke, inſtead of flying forward or laterally, always flies backward. The encounter is ſo violent, that when they ſtrike, both parties fall to the ground.

Vegetable Motion. Though vegetables have not the power of moving from one place to another like animals, they are nevertheleſs capable of moving their different parts in ſuch a manner as would lead us to ſuſpect that they are actuated by a ſort of inſtinct. Hence many have been induced to ſuppoſe, that the animal and vegetable kingdoms are in a manner indiſtinguiſhable from one another; and that the higheſt degree of vegetable life can hardly be known from the loweſt degree of animal life. The eſſential and inſuperable diſtinction, however, between the two, is the faculty of ſenſation, and locomotion in conſequence of it. Were it not, indeed, for the manifeſtation of ſenſe by moving from one place to another, we ſhould not be able to tell whether vegetables were poſſeſſed of ſenſation or not; but whatever motions they may be poſſeſſed of, it is certain that no vegetable has the faculty of moving from one place to another. Some have endeavoured to diſtinguiſh the two kingdoms by the digeſtion of food; alleging that plants have no proper organs, ſuch as a ſtomach, &c. for taking in and digeſting their aliment. But to this it has been replied, that the whole body of a vegetable is a ſtomach, and abſorbs its food at every pore. This, however, ſeems not to be a ſufficient anſwer. All animals take in their food at intervals, and there is not a ſingle inſtance of one which eats perpetually. The food is alſo taken into the body of the animal, and application of the parts made by means of the *internal* organization of the viſcus; but in vegetables, their whole bodies are immerſed in their food, and abſorb it by the ſurface, as animal bodies will ſometimes abſorb liquids when put into them. The roots of a tree indeed will change their direction when they meet with a ſtone, and will turn from barren into fertile ground; but this is evidently mere mechaniſm, without any proof of will or ſenſation; for the nouriſhment of the root comes not from the ſtone, but from the earth around it: and the increaſe in ſize is not owing to any expanſion of the matter which the root already contains,

‡ Phil. of Nat. Hiſt.

* See Actinia.

contains, but to the acquiſition of new matter: whence the increaſe of ſize muſt always take place in the direction from whence the nouriſhment proceeds. On this principle alſo we may explain the reaſon why the roots of a tree, after having arrived at the edge of a ditch inſtead of ſhooting out into the air, will creep down the one ſide, along the bottom, and up the other.

In their other movements the vegetables diſcover nothing like ſenſation or deſign. They will, indeed, uniformly bend towards light, or towards water; but in the one caſe we muſt attribute the phenomena to the action of the elements of light and air upon them; and in the latter the property ſeems to be the ſame with what in other caſes we call attraction. Thus, if a root be uncovered, and a wet ſpunge placed near it in a direction different from that in which the root was proceeding, it will ſoon alter its poſition, and turn towards the ſponge: and thus we may vary the direction of the root as often as we pleaſe. The efforts of a plant to turn from darkneſs or ſhade into ſunſhine are very remarkable; as, in order to accompliſh this, not only the leaves will be inclined, but even the ſtems and branches twiſted. When a wet ſpunge is held under the leaves of a tree, they bend down in order to touch it. If a veſſel of water be put within ſix inches of a growing cucumber, in leſs than 24 hours the latter will alter its direction; the branches will bend towards the water, and never alter their courſe until they come in contact with it. The moſt remarkable inſtance of this kind of motion, however, is, that when a pole is brought near a vine, the latter will turn towards it, and never ceaſe extending its branches till it lays hold of the ſupport.

The motions of the ſenſitive plant, and others of the ſame kind, have been conſidered as very wonderful; but it is doubtful if any of them be really more ſo than that of the vine juſt mentioned. None of theſe ſhow any kind of propenſity to move without an actual touch. A very ſlight one, indeed, makes the ſenſitive plant contract, and the whole branch, together with the leaves, bend down towards the earth.—This is ſo ſimilar to ſome phenomena of electricity, that very few will heſitate at aſcribing both to the ſame cauſe. Even the motions of the hedyſarum gyrans, which at firſt ſight ſeem ſo much more ſurpriſing than thoſe of the ſenſitive plant, may be explained upon the ſame principle. There is a ſpecimen of this plant in the botanic garden of Edinburgh. It is a native of the Eaſt Indies. and its motions are occaſioned by the ſun-beams. The leaves are the only moveable parts. They are ſupported by long footſtalks; and when the ſun ſhines upon them they move briſkly in every direction. Their moſt uſual motion is upward and downward; but not unfrequently they turn almoſt quite round, and then the foot-ſtalks are evidently twiſted. Theſe motions continue only while the light and heat of the ſun continues, ceaſing when at night, or when the weather becomes cloudy and cold. The American plant called *Dionæa muſcipula, or Venus's fly trap*, is another example of very wonderful mechaniſm in vegetables, though even this does not argue any degree of ſenſation in this plant more than in others. The leaves of the dionæa are jointed, and furniſhed with two rows of prickles. A number of ſmall glands upon the ſurface ſecrete a ſweet juice, which entices flies to come and ſettle upon it; but the moment they touch the ſaid ſpot, the leaves fold up, and ſqueeze them to death between the prickles. The leaves fold up in the ſame manner when the plant is touched with a ſtraw or pin.

The folding up of the leaves of certain plants in the abſence of the ſun's light, called their *ſleep*, affords another very curious inſtance of vegetable motion.—Almoſt all vegetables, indeed, undergo ſuch a remarkable change in the night, that it is difficult to know exactly how many kinds do really ſleep. They fold up their leaves in many different ways; but all agree in diſpoſing of them in ſuch a manner as to afford the beſt protection to the young ſtems, flower-buds, or fruit. The leaves of the tamarind-tree contract round the young fruit, in order to protect it from nocturnal cold; and thoſe of ſenna, glycina, and many other papilionaceous plants, diſpoſe of their leaves in the ſame manner. The leaves of the chickweed, aſclepias, atriplex, &c. are diſpoſed in oppoſite pairs. In the night-time they riſe perpendicularly, and join ſo cloſe at the top that the flowers are concealed by them. In like manner do the leaves protect the flowers of the ſida, or althæa theophraſti, the aycnia, and œnothira, the ſolanum, and the Egyptian vetch. All theſe are erected during the night; but thoſe of the white lupine, in time of ſleep, hang down.

The flowers of plants alſo have motions peculiar to themſelves. Many of them during the night are incloſed in their calyxes. Some, particularly thoſe of the German ſpurge, geranium ſtriatum, and common Whitlow graſs, when aſleep bend towards the earth; by which means the noxious effects of rain or dew are prevented. All theſe motions have been commonly aſcribed to the ſun's rays; and Mr Smellie informs us, that in ſome of the examples above mentioned the effects were evidently to be aſcribed to heat; but plants kept in an hot-houſe, where the temperature of the day and night are alike, contract their leaves, and ſleep in the ſame manner as if they were expoſed to the open air; "whence it appears (ſays he), that the ſleep of plants is owing rather to a peculiar law, than to a quicker or ſlower motion of the juices." He ſuſpects, therefore, that as the ſleep of plants is not owing to the mere abſence of heat, it may be occaſioned by the want of light; and to aſcertain this he propoſes an experiment of throwing upon them a ſtrong artificial light. "If, notwithſtanding this light (ſays he), the plants are not rouſed, but continue to ſleep as uſual, then it may be preſumed that their organs, like thoſe of animals, are not only irritable, but require the reparation of ſome invigorating influence which they have loſt while awake, by the agitations of the air and of the ſun's rays, by the act of growing, or by ſome other latent cauſe." On this, however, we muſt remark, that the throwing of artificial light upon plants cannot be attended with the ſame conſequences as that of the light of the ſun, unleſs the former were as ſtrong as the latter, which is impoſſible; and even granting that we could procure an artificial light as ſtrong as that of the ſun, a difference might be occaſioned by the different directions of the rays, thoſe of the ſun being very nearly parallel, while the rays of all artificial light diverge very greatly. If, therefore, we are to make an experiment of this kind, the rays ſhould be rendered parallel by means of a burning mirror. Here again we would be involved in a difficulty: for the rays of the ſun proceed all in one direction; but as of neceſſity we muſt employ different mirrors in our experiment, the light muſt fall upon the plant in different directions, ſo that we could not reaſonably expect the ſame reſult as when the plants are directly expoſed to the rays of the ſun.

The motion of plants, not being deducible from ſenſation, as in animals, muſt be aſcribed to that property called *irritability*: and this property is poſſeſſed *viſibly* by the parts of animals in a greater degree than even by the moſt irritable vegetable. The muſcular fibres will contract on the application of any ſtimulating ſubſtance, even after they are detached from the body to which they belonged. The heart of a frog will continue to beat when pricked with a pin for ſeveral hours after it is taken out of the body. The heart of a viper, or of a turtle, beats diſtinctly from 20 to 30 hours after the death of theſe animals. When the inteſtines of a dog, or any other quadruped, are ſuddenly cut into different portions, all of them crawl about like worms, and contract upon the ſlighteſt touch. The heart, inteſtines, and diaphragm, are the moſt irritable parts of animal bodies; and to diſcover whether this quality reſides in all plants, experiments ſhould be made chiefly on leaves, flowers, buds, and the tender fibres of the roots.

The motions of plants are univerſally aſcribed by our author to *irritability*, to which alſo we have aſcribed them under the article Animal. The term, however, requires an explanation; and to give this in an intelligible manner requires ſome attention. The moſt obvious compariſon is that of an electrified thread; which, on the approach of any unelectrified ſubſtance, ſhows a variety of motions, equally ſurpriſing with thoſe of the parts of plants or the muſcular fibres cut out of the body. Could we ſuppoſe that the electricity of a thread might be preſerved after it was cut off from the electrifying ſubſtance, it would ſhow as much irritability as even the muſcular fibres, or portions of the inteſtines of animals. We know, from the, hiſtory of the torpedo, electrical eel, &c. that there are animals in which the electric fluid acts in ſuch a manner as to produce a much more powerful effect than that of giving motion to the leaves of plants. The readineſs, therefore, with which this fluid is thrown into agitations when any ſubſtance in which it acts is touched, is without doubt the irritability in queſtion; but we have from thence no more reaſon to aſcribe ſenſation to theſe irritable bodies, than to an electrified bottle when it diſcharges itſelf, or makes a cork-ball play around it.

In a paper read before the Academy of Sciences at Paris, by M. Brouſſonet, the author inclines to confound irritability and ſenſibility together. "The different parts of plants (ſays he) enjoy the faculty of motion; but the motions of a vegetable are very different in their nature from thoſe of an animal: the moſt ſenſible, thoſe that are produced with moſt rapidity in plants, are always influenced by ſome ſtimulating cauſe. Irritability, which is nothing but *ſenſibility* made manifeſt by motion, is a general law to which nature has ſubjected all living beings; and it is this that continually watches over their preſervation. Being more powerful in animals than in plants, it may be often confounded in theſe laſt with phenomena that depend on a quite different cauſe. In the vegetable it is only the organ which is expoſed to the action of the ſtimulating power that moves. Irritation in particular places never produces that prompt combination of ſenſations which we obſerve in animals; in conſequence of which certain parts are put in motion without being directly affected, and which otherwiſe might have been paſſive.

"The more perfect the organization in the different parts of animals is, the more apparent are the ſigns of irritability. The parts that come neareſt to thoſe of vegetables, and in which of conſequence the organization is moſt imperfect, are the leaſt irritable. The ſame law holds with regard to plants; but the reſult is oppoſite: the ſigns of irritability are moſt ſenſible in proportion to the analogy of the parts with thoſe of animals; and they are imperceptible in thoſe that are diſſimilar. This aſſertion is proved by what we obſerve in the organs deſtined in vegetables to perpetuate the ſpecies. Thoſe parts alone ſeem ſenſible to ſtimuli; the bark, leaves, ſtalks, and roots ſhowing no ſigns of irritability.

"The vital motions in plants are ſlow, and entirely determined by circumſtances, which are always repeated and equally diffuſed over all the parts. In animals, on the contrary, almoſt all the vital motions are very ſenſible; ſuch are the pulſations of the heart and arteries, the dilation of the thorax, &c.: theſe being abſolutely neceſſary to the preſervation of the individual, are always reproduced in a ſimilar manner in thoſe of the ſame ſpecies. and in the ſame direction; and this takes place in like manner in plants. The twining plants, for inſtance ſuch as the hop, follow conſtantly, as they twiſt themſelves round a pole, the direction of the ſouth towards the weſt. If vegetables are obſtructed in exerciſing theſe motions, they ſoon periſh; if, for example, we untwiſt a twining plant which had taken its direction round a branch from the right to the left, and place it in a contrary direction, it withers in a ſhort time; eſpecially if it has not vigour enough to regain its natural ſituation. We bring death in the ſame manner on an animal, if we interrupt any of its vital motions. The law by which plants are forced to move in a particular manner is very powerful. When two twining plants, one of which is weaker than the other, for example two plants of woodbine, happen to encounter, they twiſt round each other, the one directing itſelf to the right and the other to the left: this laſt is always the weakeſt; it is forced to take a direction contrary to that which it would have done if it had not met with the other; but if by any accident, theſe two twigs of woodbine ſhould come afterwards to be ſeparated, they both reſume their natural direction, that is from right to left.

"The motions eſſentially vital, which have in plants the greateſt affinity with thoſe of animals, are the courſe of the ſap, the paſſage of the air in the, trachea, the different poſitions which the flowers of certain plants take at certain hours of the day &c. But if we attend to the manner in which all theſe motions in plants are performed, we will find that they preſent a greater number of modifications than the analogous motions that take place in animals. The temperature of the atmoſphere, its agitation, light, &c. have great influence on the motion of plants, by accelerating or retarding the courſe of their fluids; and, as they cannot change their place, theſe variations produce in them changes more obvious and more uniform than in animals."

Our author now proceeds to inform us, that ſome of the motions of plants are occaſioned by the rarity of the juices in plants, and others by their abundance. Of the former kind are thoſe by which the capſules of ſome plants ſuddenly burſt with a ſpring, and throw their ſeeds to ſome diſtance, Of the other kind are the action of the ſtamina in the *parietaria*, the inflection of the peduncles of flowers, and of the piſtilla. "Theſe motions (ſays he) which are particularly obſerved in the organs deſtined to the reproduction of the individual, not appearing except in circumſtances that render them abſolutely neceſſary, ſeem in ſome meaſure to be the effect of a particular combination: they are, however, merely mechanical; for they are always produced in the ſame way and in the ſame circumſtances. Thus the roſe of Jericho, and the dry fruit of ſeveral ſpecies of *meſembryanthemum*, do not open but when their veſſels are full of water.

"The ſudden diſengagement of fluids produces a kind of motion. To this cauſe we muſt attribute a great number of phenomena obſervable in the leaves of ſeveral plants, and which do not depend on irritability. The ſmall glands in each leaf of the *dionæa* are no ſooner punctured by an inſect than it inſtantly folds up and ſeizes the animal: the puncture ſeems to operate a diſengagement of the fluid which kept the leaf expanded by filling its veſſels. This explanation is the more probable, that in the early ſtate of the vegetation of this plant, when the ſmall glands are hardly evolved, and when probably the juices do not run in ſufficient abundance, the leaves are folded up exactly as they appear when punctured by an inſect at a more advanced period. We obſerve a phenomenon ſimilar to this in both ſpecies of the *droſera* (ſundew). The mechaniſm here is very eaſily obſervable: the leaves are at firſt folded up: the juices are not yet propelled into the fine hairs with which they are covered; but after they are expanded, the preſence of the fluid is manifeſt by a drop ſeen at the extremity of each hair: it is by abſorbing this fluid that an inſect empties the veſſels of the leaf, which then folds up, and reſumes its firſt ſtate: the promptitude of the action is proportioned to the number of hairs touched by the inſect. This motion in ſome degree reſembles that which takes place in the limb of an animal kept, in a ſtate of flexion by a tumour in the joint; when the matter which obſtructed the motion is diſcharged, the limb inſtantly reſumes its former poſition. The phenomena that depend on the abundance of fluids are particularly evident in plants which grow in wet ſoils; the *droſera* and *dionæa* are of this kind; and it is known by the experiments of Meſſ. Du Fay and Du Hamel, that ſenſitive plants are particularly ſenſible when the ſun is obſcured by clouds and the air warm and moiſt. The influence of external cauſes ſometimes ſo modifies the vital motion in plants, that we would be tempted to aſcribe them to volition, like thoſe that depend entirely on that faculty in animals. If we ſet a pole in the ground near a twining plant, it always lays hold of the pole for ſupport. in whatever place we put it. The ſame thing occurs in the tendrils of the vine; which always attach themſelves to the ſupport preſented them on whatever ſide it may be placed, provided they can reach it: but theſe motions are entirely vital: the twining plants and the tendrils direct themſelves to every quarter, and conſequently cannot fail of meeting with the bodies within their reach. Theſe motions are performed as long as the parts continue to grow; but when they ceaſe to elongate, if they have not been able to reach any body on which they can fix, they bend back upon themſelves. This and other obſervations ſhow how far the vital motions in plants may be modified by external cauſes, and how eſſentially they differ from thoſe that are the effect of volition in animals.

"Some plants appear endowed with no ſort of motion: ſome have leaves that can move in different directions; their motions are generally modified by different cauſes; but none appear ſo eminently poſſeſſed of this quality as the *hedyſarumgyrans* of Linnæus.—No part of this plant ſhows any ſigns of irritabilityupon application of ſtimuli: and the motion of its foliola ceaſes when the leafets are agitated by the wind.—When the ſun is warm, the little leaves of the hedyſarum are alſo immoveable; but when the weather is warm and moiſt, or when it rains, they move very freely. This motion ſeems indiſpenſably neceſſary to the plant; for it begins as ſoon as the firſt leaves unfold, and continues even during the night; but in time it grows weaker. In our ſtoves it is moſt conſiderable during the firſt year; in the ſecond it is not very ſenſible: in its native place all the leaves have a motion never obſerved here. The moving leafets are moſt agitated while the plants are in full flower, and the proceſs of fructification goes on. The oſcillatory motion is ſo natural to it, that it not only remains for three or four days in the leafets of a branch that has been cut off and put in water, but is even continued though the branch be expoſed to the air. The leaves ſeem to perform the office of the heart in vegetables. When a plant is ſtripped of its leaves, the progreſs of vegetation is arreſted; and ſuch vegetables reſemble thoſe animals which have a periodical ſleep, induced by a diminution of the action of the heart. Many plants hardly ſhow any ſigns of motion; many ſeem alſo wholly cataleptic; which is rarely if ever found in animals. The footſtalks of the flowers of dracocephalum, a Virginian plant, preſerve themſelves in whatever poſition they are placed.

Muſcular MOTION. See MUSCLE.

MOTIVE, is ſometimes applied to that faculty of the human mind, by which we purſue good and avoid evil. Thus Hobbes diſtinguiſhes the faculties of the mind into two ſorts, the cognitive and motive.

MOTTE (Anthony Houdart de la), an ingenious Frenchman, greatly diſtinguiſhed by his writings in proſe and verſe, and by his literary conteſts with many eminent perſons, was born at Paris in 1672. He wrote with very different ſucceſs, no man having been more praiſed or more criticiſed than he was: his literary paradoxes,

doxes, his ſingular ſyſtems, in all branches of polite learning, and above all his judgment upon the ancients, which, like thoſe of Perrault, were thought diſreſpectful and detracting, raiſed him up formidable adverſaries. Racine Boileau. Rouſſeau, and Madam Dacier, were among the number of thoſe who made it their buſineſs to avenge antiquity on a man who, with more wit than genius or learning, aſſumed a kind of dictatorial authority in the province of belles letters. He became blind in the latter years of his life, and died in 1731. He wrote a great deal in epic poetry tragedy, comedy, lyric, paſtoral, and fables; beſides a vaſt variety of diſcourſes, critical and academical, in proſe. A complete edition of all his works was publiſhed in 11 vols 8vo, in 1754; though, as has been ſaid of our Swift, his reputation had been better conſulted by reducing them to three or four.

MOTOUALIS, a ſmall nation of Syria, inhabiting to the eaſt of the country of the DRUSES, in the valley which ſeparates their mountains from thoſe of Damaſcus; of which the following account is given by Mr Volney in his Travels, vol. ii. p. 48.

The characteriſtic diſtinction between them and the other inhabitants of Syria (ſays our author) is, that they, like the Perſians, are of the ſect of Ali, while all the Turks follow that of Omar, or Moaouia. This diſtinction, occaſioned by the ſchiſm which in the 36th year of the Hejira aroſe among the Arabs, reſpecting the ſucceſſors of Mahomet, is the cauſe of an irreconcileable hatred between the two parties. The ſectaries of Omar, who conſider themſelves as the only orthodox, aſſume the title of *Sonnites* which has that ſignification, and term their adverſaries *Shiites*, that is "ſectaries of Ali." The word *Motoualis* has the ſame meaning in the dialect of Syria. The followers of Ali, diſſatisfied with this name, ſubſtitute that of *Adlia*, which means "aſſertors of juſtice," literally "Juſticians;" a denomination which they have aſſumed in conſequence of a doctrinal point they advance in oppoſition to the Sonnite faith. A ſmall Arabic treatiſe, entitled Theological Fragments concerning the Sects and Religions of the World, has the following paſſage:

"Thoſe ſectaries who pretend that God acts only on principles of juſtice, conformable to human reaſon, are called *Adlia* or *Juſticians*. God cannot (ſay they) command an impracticable worſhip, nor ordain impoſſible actions, nor enjoin men to perform what is beyond their ability; but wherever he requires obedience, will beſtow the power to obey. He removes the cauſe of evil, he allows us to reaſon, and requires only what is eaſy, not what is difficult; he makes no man reſponſible for the actions of another, nor puniſhes him for thoſe in which he had no part: he imputes not as a crime what himſelf has created in man; nor does he require him to avoid what deſtiny has decreed. This would be injuſtice and tyranny, of which God is incapable from the perfection of his being." To this doctrine, which diametrically oppoſes the ſyſtem of the Sonnites, the Motoualis add certain ceremonies which increaſe their mutual averſion. They curſe Omar and Moawia as rebels and uſurpers; and celebrate Ali and Hoſein as ſaints and martyrs. They begin their ablutions at the elbow, inſtead of the end of the fingers, as is cuſtomary with the Turks; they think themſelves defiled by the touch of ſtrangers; and, contrary to the general practice of the Eaſt, neither eat nor drink out of a veſſel which has been uſed by a perſon not of their ſect, nor will they even ſit with ſuch at the ſame table.

These doctrines and cuſtoms, by ſeparating the Motoualis from their neighbours have rendered them a diſtinct ſociety. It is ſaid they have long exiſted as a nation in this country, though their name has never been mentioned by any European writer before the preſent century; it is not even to be found in the maps of Denville: La Roque, who left their country not a hundred years ago, gives them the name of *Amediens*. Be this as it may, in latter times their wars, robberies, ſucceſſes, and various changes of fortune, have rendered them of conſequence in Syria. Till about the middle of this century, they only poſſeſſed Balbek their capital, and a few places in the valley, and Anti-Lebanon, which ſeems to have been their original country. At that period we find them under a like government with the Druzes, that is to ſay, under a number of Shaiks, with one principal chief of the family of Harfouſh. After the year 1750 they eſtabliſhed themſelves among the heights of Bekaa, and got footing in Lebanon, where they obtained lands belonging to the Maronites, almoſt as far as Beſharrai. They even incommoded them ſo much by their ravages, as to oblige the Emir Youſef to attack them with open force and expel them; but on the other ſide, they advanced along the river even to the neighbourhood or Sour, (Tyre). In this ſituation, Shaik Daher had the addreſs, in 1760, to attach them to his party. The pachas of Saide and Damaſcus claimed tributes, which they have neglected paying, and complained of ſeveral robberies committed on their ſubjects by the Motoualis; they were deſirous of chaſtiſing them; but this vengeance was neither certain nor eaſy. Daher interpoſed; and by becoming ſecurity for the tribute; and promiſing to prevent any depredations, acquired allies who were able, as it is ſaid, to arm 10,000 horſemen, all reſolute and formidable troops. Shortly after they took poſſeſſion of Sour, and made this village the principal ſea-port. In 1771 they were of great ſervice to Ali Bey and Daher againſt the Ottomans. But Emir Youſef having in their abſence armed the Druzes, and ravaged their country. He was beſieging the caſtle of Djezin when the Motoualis, returning from Damaſcus, received intelligence of this invaſion. At the relation of the barbarities committed by the Druzes, an advanced corps, of only 500 men, were ſo enraged, that they immediately ruſhed forward to attack the enemy, determined to periſh in taking vengeance. But the ſurpriſe and confuſion they occaſioned, and the diſcord which reigned between the two factions of Manſour and Youſef ſo much favoured this deſperate attack, that the whole army, conſiſting of 25,000 men, was completely overthrown.

In the following year, the affairs of Daher taking a favourable turn, the zeal of the Motoualis cooled towards him, and they finally abandoned him in the cataſtrophe in which he loſt his life. But they have ſuffered for their imprudence under the adminiſtration of the pacha who ſucceeded him. Since the year 1777, Djezzar, maſter of Acre and Saide has inceſ-

ſantly

ſently laboured to deſtroy them. His perſecution forced them in 1784 to a reconciliation with the Druſes, and to enter into an alliance with the Emir Youſef. Though reduced to leſs than 700 armed men, they did more in that campaign than 15,000 or 20,000. Druzes and Maronites aſſembled at Dair-el-Kamar. They alone took the ſtrong fortreſs of Mar-Djebaa, and put to the ſword 50 or 60 Epirots who defended it. But the miſunderſtanding which prevailed among the chiefs of the Druzes having rendered abortive all their operations, the pacha has obtained poſſeſſion of the whole valley, and the city of Balbek itſelf. At this period not more than 500 families of the Motoualis remained, who took refuge in Anti-Lebanon, and the Lebanon of the Maronites; and, driven as they now are from their native ſoil, it is probable they will be totally annihilated, and even their very name become extinct.

MOTTEUX (Peter), a French gentleman, born and educated at Rouen in Normandy. Coming over to England on account of the perſecution of the Proteſtants, he became a conſiderable trader in London, kept an Eaſt-India warehouſe in Leadenhall-ſtreet, and had a genteel place in the general poſt-office, relating to foreign letters, being maſter of ſeveral languages. He was a man of wit and humour; and acquired ſo perfect a maſtery of the Engliſh language, that he not only was qualified to oblige the world with a very good tranſlation of Don Quixote, but alſo wrote ſeveral ſongs, prologues, epilogues, &c. and what was ſtill more extraordinary, became a very eminent dramatic writer in a language to which he was not a native. He was at laſt, in the year 1718, found dead in a diſorderly houſe, on his birth day, when he completed his 58th year.

MOTTO, in armoury, a ſhort ſentence or phraſe, carried in a ſcroll, generally under, but ſometimes over, the arms; ſometimes alluding to the bearing, ſometimes to the name of the bearer, and ſometimes containing whatever pleaſes the fancy of the deviſer.

MOUCHO MORE. See AGARICUS.

MOVEABLE, in general, denotes any thing capable of being moved.

MOVEABLE-Feaſts, are ſuch as are not always held on the ſame day of the year or month; though they be on the ſame day of the week. See FEASTS.

Thus, Eaſter is a moveable feaſt, being always held on the Sunday which falls upon or next after the firſt full moon following the 21ſt of March.

All the other moveable feaſts follow Eaſter, *i. e.* they keep their diſtance from it; ſo that they are fixed with reſpect thereto.

Such are Septuageſima, Sexageſima, Aſh-Wedneſday, Aſcenſion-day, Pentecoſt, Trinity-Sunday, &c. which ſee under their proper articles, SEPTUAGESIMA, &c.

MOVEABLE Subject, in law, any thing that moves itſelf, or can be moved; in contradiſtinction to immoveable or heritable ſubjects, as lands, houſes, &c.

MOVEMENT, MOTION, a term frequently uſed in the ſame ſenſe with automaton.

The moſt uſual movements for keeping time are watches and clocks: the firſt are ſuch as ſhow the parts of time, and are portable in the pocket; the ſecond, ſuch as publiſh it by ſounds, and are fixed as furniture. See HOROLOGY.

MOVEMENT, in its popular uſe among us, ſignifies all the inner work of a watch, clock, or other engine, which move, and by that motion carry on the deſign of the inſtrument.

The movement of a clock or watch is the inſide, or that part which meaſures the time, ſtrikes, &c. excluſive of the frame, caſe, dial-plate, &c.

The parts common to both of theſe movements are, the main-ſpring, with its appurtenances; lying in the ſpring-box, and in the middle thereof lapping about the ſpring-arbor, to which one end of it is faſtened. A-top of the ſpring arbor is the endleſs-ſcrew and its wheel; but in ſpring-clocks, this is a ratchet-wheel with its click, that ſtops it. That which the main-ſpring draws, and round which the chain or ſtring is wrapped, is called the *fuſy;* this is ordinarily taper; in large works, going with weights, it is cylindrical, and called the *barrel.* The ſmall teeth at the bottom of the fuſy or barrel, which ſtop it in winding up, is called the *ratchet;* and that which ſtops it when wound up, and is for that end driven up by the ſpring, the *garde-gut.* The wheels are various: the parts of a wheel are, the hoop or rim; the teeth, the croſs, and the collet or piece of braſs ſoldered on the arbor or ſpindle whereon the wheel is rivetted. The little wheels playing in the teeth of the larger are called *pinions;* and their teeth, which are 4, 5, 6, 8, &c. are called *leaves;* the ends of the ſpindle are called *pivots;* and the guttered wheel, with iron ſpikes at bottom, wherein the line of ordinary clocks runs, the *pulley.* We need not ſay any thing of the hand, ſcrews, wedges, ſtops, &c. See WHEEL, FUSY, &c.

Perpetual MOVEMENT. Many have attempted to find a perpetual movement, but without ſucceſs; and there is reaſon to think, from the principles of mechanics, that ſuch a movement is impoſſible: for though, in many caſes of bodies acting upon one another, there is a gain of abſolute motion, yet the gain is always equal in oppoſite directions; ſo that the quantity of direct motion is never increaſed.

To make a perpetual movement, it appears neceſſary that a certain ſyſtem of bodies, of a determined number and quantity, ſhould move in a certain ſpace for ever, and in a certain way and manner; and for this there muſt be a ſeries of actions returning in a circle, otherwiſe the movement will not be perpetual; ſo that any action by which the abſolute quantity of force is increaſed, of which there are ſeveral ſorts, muſt have its correſponding counter-action, by which the gain is deſtroyed, and the quantity of force reſtored to its firſt ſtate.

Thus by theſe actions there will never be any gain of direct force to overcome the friction and reſiſtance of the medium; ſo that every motion being diminiſhed by theſe reſiſtances, they muſt at length languiſh and ceaſe.

MOUFET (Thomas), a celebrated Engliſh phyſician, was born at London, and practiſed medicine with great reputation. Towards the latter end of his life he retired to the country, and died about the year 1600. This phyſician is known by a work which was begun by Edward Wotton, and printed at London in

1634, folio, with the title of *Theatrum Inſectorum.* A tranſlation of it into Engliſh was publiſhed at London in 1658, folio. Martin Liſter gives a very unfavourable opinion of this book: "As Mouſet (ſays he) made uſe of Wotton, Geſner, &c. an excellent work might have been expected from him; and yet his *Theatrum* is full of confuſion, and he has made a very bad uſe of the materials with which theſe authors have furniſhed him. He is ignorant of the ſubject of which he treats and his manner of expreſſion is altogether barbarous. Beſides this, he is extremely arrogant, to ſay no worſe; for though he has copied Aldrovandus in innumerable places, he never once mentions his name." But Ray thinks that Liſter, by expreſſing himſelf in this manner, has not done juſtice to Mouſet; and he maintains that the latter has rendered an eſſential ſervice to the republic of letters.

MOUG-DEN, or Chen-yang; a city of Chineſe Tartary, and capital of the country of the Mantchews or eaſtern Tartars. Theſe people have been at great pains to ornament it with ſeveral public edifices, and to provide it with magazines of arms and ſtorehouſes. They conſider it as the principal place of their nation; and ſince China has been under their dominion, they have eſtabliſhed the ſame tribunals here as at Peking, excepting that called *Lii-pou;* theſe tribunals are compoſed of Tartars only; their determination is final; and in all their acts they uſe the Tartar characters and language. The city is built on an eminence: a number of rivers add much to the fertility of the ſurrounding country. It may be conſidered as a double city, of which one is incloſed within the other: the interior contains the emperor's palace, hotels of the principal mandarins, ſovereign courts, and the different tribunals; the exterior is inhabited by the common people, tradeſmen, and all thoſe who by their employments or profeſſions are not obliged to lodge in the interior The latter is almoſt a league in circumference; and the walls which encloſe both are more than three leagues round: theſe walls were entirely rebuilt in 1631, and repaired ſeveral times under the reign of Kang-hi.—Near the gates are two magnificent tombs of the firſt emperors of the reigning family, built in the Chineſe manner, and ſurrounded by a thick wall furniſhed with battlements; the care of them is entruſted to ſeveral Mantchew mandarins, who at ſtated times are obliged to perform certain uſual ceremonies; a duty which they acquit themſelves of with the ſame marks of reſpect and veneration as if their maſters were ſtill living.

MOVING plants. See Hedysarum, Tremella, and Mimosa.

MOULD, or Mold, in the mechanic arts, &c. a cavity artfully cut, with deſign to give its form or impreſſion to ſome ſofter matter applied therein. Moulds are implements of great uſe in ſculpture, foundery, &c. The workmen employed in melting the mineral or metallic glebe dug out of mines, have each their ſeveral moulds to receive the melted metal as it comes out of the furnace; but theſe are different according to the diverſity of metals and works. In gold mines, they have moulds for ingots; in ſilver mines, for bars; in copper and lead mines, for pigs or ſalmons; in tin mines, for pigs and ingots; and in iron mines, for ſows, chimney-backs, anvils, caldrons, pots, and other large utenſils and merchandizes of iron; which are here caſt, as it were, at firſt hand.

Moulds of founders of large works, as ſtatues, bells, guns, and other brazen works, are of wax, ſupported within-ſide by what we call a core, and covered without-ſide with a cap or caſe. It is in the ſpace which the wax took up, which is afterwards melted away to leave it free, that the liquid metal runs, and the work is formed; being carried thither through a great number of little canals, which cover the whole mould. See Foundery.

Moulds of moneyers are frames full of ſand, wherein the plates of metal are caſt that are to ſerve for the ſtriking of ſpecies of gold and ſilver. See Coining.

A ſort of concave moulds made of clay, having within them the figures and inſcriptions of ancient Roman coins, are found in many parts of England, and ſuppoſed to have been uſed for the caſting of money. Mr Baker having been favoured with a ſight of ſome of theſe moulds found in Shropſhire, bearing the ſame types and inſcriptions with ſome of the Roman coins, gave an account of them to the Royal Society. They were found in digging of ſand, at a place called Ryton in Shropſhire, about a mile from the great Watling-ſtreet road. They are all of the ſize of the Roman denarius, and of little more than the thickneſs of our halfpenny. They are made of a ſmooth pot or brick clay, which ſeems to have been firſt well cleanſed from dirt and ſand, and well beat or kneaded, to render it fit for taking a fair impreſſion. There were a great many of them found together, and there are of them not unfrequently found in Yorkſhire; but they do not ſeem to have been met with in any other kingdom, except that ſome have been ſaid to be once found at Lyons. They have been ſometimes found in great numbers joined together ſide by ſide, on one flat piece of clay, as if intended for the caſting of a great number of coins at once; and both theſe, and all the others that have been found, ſeem to have been of the emperor Severus. They are ſometimes found impreſſed on both ſides, and ſome have the head of Severus on one ſide and ſome well known reverſe of his on the other. They ſeem plainly to have been intended for the coinage of money, though it is not eaſy to ſay in what manner they can have been employed to that purpoſe, eſpecially thoſe which have impreſſions on both ſides, unleſs it may be ſuppoſed that they coined two pieces at the ſame time by the help of three moulds, of which this was to be the middle one. If by diſpoſing theſe into ſome ſort of iron frame or caſe, as our letter-founders do the braſs moulds for caſting their types, the melted metal could be eaſily poured into them, it would certainly be a very eaſy method of coining, as ſuch moulds require little time or expence to make, and therefore might be ſupplied with new ones as often as they happen to break.

Theſe moulds ſeem to have been burnt or baked ſufficiently to make them hard; but not ſo as to render them porous like our bricks, whereby they would have loſt their ſmooth and even ſurface, which in theſe is plainly ſo cloſe, that whatever metal ſhould be formed in them would have no appearance like the ſand-holes by which counterfeit coins and medals are uſually detected.

Moulds of founders of ſmall works are like the frames of coiners; it is in theſe frames, which are likewiſe filled with ſand, that their ſeveral works are faſhioned; into which, when the two frames, whereof the mould is compoſed, are rejoined, the melted braſs is run.

Moulds of letter-founders, are partly of ſteel and partly wood. The wood, properly ſpeaking, ſerves only to cover the real mould which is within, and to prevent the workman, who holds it in his hand, from being incommoded by the heat of the melted metal. Only one letter or type can be formed at once in each mould. See Letter-Foundery.

Moulds, in the manufacture of paper, are little frames compoſed of ſeveral braſs or iron wires, faſtened together by another wire ſtill finer. Each mould is of the bigneſs of the ſheet of paper to be made, and has a rim or ledge of wood to which the wires are faſtened. Theſe moulds are more uſually called frames or forms. See *Paper-Making*.

Moulds, with furnace and crucible makers, are made of wood, of the ſame form with the crucibles; that is, in form of a truncated cone: they have handles of wood to hold and turn them with, when, being covered with the earth, the workman has a mind to round or flatten his veſſel.

Moulds for leaden bullets are little iron pincers, each of whoſe branches terminates in a hemiſpherical concave, which when ſhut form an entire ſphere. In the lips or ſides where the branches meet, is a little jet or hole, through which the melted lead is conveyed.

Laboratory Moulds, are made of wood, for filling and driving all ſorts of rockets and cartridges, &c.

Glaziers Moulds. The glaziers have two kinds of moulds, both ſerving to caſt their lead: in the one they caſt the lead into long rods or canes fit to be drawn through the vice, and the grooves formed therein; this, they ſometimes call ingot-mould. In the other, they mould thoſe little pieces of lead a line thick and two lines broad, faſtened to the iron bars. Theſe may be alſo caſt in the vice.

Goldſmiths Moulds. The goldſmiths uſe the bones of the cuttle-fiſh to make moulds for their ſmall works; which they do by preſſing the pattern between two bones, and leaving a jet or hole to convey the ſilver through, after the pattern has been taken out.

Mould, among maſons, is a piece of hard wood or iron, hollowed within ſide, anſwerable to the contours of the mouldings or cornices, &c. to be formed. This is otherwiſe called *caliber*.

Moulds, among plumbers, are the tables whereon they caſt their ſheets of lead. Theſe they ſometimes call ſimply *tables*. Beſides which they have other real moulds, wherewith they caſt pipes without ſoldering. See each deſcribed under Plumbery.

Moulds, among the glaſs-grinders, are wooden frames, whereon they make the tubes wherewith they fit their perſpectives, teleſcopes, and other optic machines. Theſe moulds are cylinders, of a length and diameter according to the uſe they are to be applied to, but always thicker at one end than the other, to facilitate the ſliding. The tubes made on theſe moulds are of two kinds; the one ſimply of paſteboard and paper; the other of thin leaves of wood joined to the paſteboard. To make theſe tubes to draw out, only the laſt or innermoſt is formed on the mould; each tube made afterwards ſerving as a mould to that which is to go over it, but without taking out the mould from the firſt. See Grinding.

Moulds uſed in baſket-making are very ſimple, conſiſting ordinarily of a willow or oſier turned or bent into an oval circle, ſquare, or other figure, according to the baſkets, panniers, hampers, and other utenſils intended. On theſe moulds they make, or more properly meaſure, all their work; and accordingly they have them of all ſizes, ſhapes, &c.

Mould, in ſhip-building, a thin flexible piece of timber, uſed by ſhipwrights as a pattern whereby to form the different curves of the timbers, and other compaſſing pieces in a ſhip's frame. There are two ſorts of theſe, viz. the bend-mould and hollow-mould; the former of theſe determines the convexity of the timbers, and the latter their concavity on the outſide, where they approach the heel, particularly towards the extremities of the veſſel. The figure given to the timbers by this pattern is called their *bevelling*.

Moulds, among tallow-chandlers, are of two kinds: the firſt for the common dipped candles, being the veſſel wherein the melted tallow is diſpoſed, and the wick dipped. This is of wood, of a triangular form, and ſupported on one of its angles; ſo that it has an opening of near a foot a-top: the other, uſed in the fabric of mould candles, is of braſs, pewter, or tin.—Here each candle has its ſeveral mould. See Candle.

Mould, among gold-beaters, a certain number of leaves of vellum or pieces of guts cut ſquare, of a certain ſize, and laid over one another, between which they put the leaves of gold and ſilver which they beat on the marble with the hammer. See Gold-leaf.

They have four kinds of moulds; two whereof are of vellum and two of gut: the ſmalleſt of thoſe of vellum conſiſts of 40 or 50 leaves; the largeſt contains 100: for the others, each contain 500 leaves The moulds have all their ſeveral caſes, conſiſting of two pieces of parchment, ſerving to keep the leaves of the mould in their place, and prevent their being diſordered in beating.

Mould, in agriculture, a general name for the ſoft earthy ſubſtance with which the dry land is generally covered, and in which all kinds of vegetables take root and grow. It is, however, far from being an homogeneous ſubſtance; being compounded of decayed animal and vegetable matters, calcareous, argillaceous, and ſiliceous earths, all mixed together in various proportions, and with the different degrees of moiſture, conſtituting all the varieties of soil throughout the world. All kinds of mould contain ſome inflammable ſubſtance, which remains in them from the decayed animals and vegetables; and they are more or leſs black in proportion to the quantity of phlogiſton they contain. The black mould yields by diſtillation a volatile alkali and oil.

MOULDINESS, a term applied to bodies which corrupt in the air, from ſome hidden principle of humidity therein; and whoſe corruption ſhows itſelf by a certain white down or lanugo on their ſurface, which viewed through a microſcope appears like a kind of meadow, out of which ariſe herbs and flowers, ſome only in the bud, others full-blown, and others decayed; each having its root, ſtalk, and other parts. See Mucor.

MOULDING, any thing caſt in in a mould, or that ſeems to have been ſo, though in reality it were cut with a chiſel or the axe.

Mouldings in architecture, projectures beyond the naked wall, column, wainſcot, &c. the aſſemblage of which forms corniches, door-caſes, and other decorations of Architecture. See that article.

MOULIN (Charles du), a celebrated civilian, and one of the moſt learned men of the 16th century, was born of a conſiderable family at Paris in 1500, and acquired great reputation by his ſkill in the law. He publiſhed many works, which have been collected together, and printed in five volumes folio; and are juſtly conſidered as the moſt excellent works that France has produced on the ſubject of civil law. He died at Paris in 1566.

Moulin (Peter du), a Proteſtant divine, believed to be of the ſame family with the former, was born in 1568. He taught philoſophy at Leyden; and afterwards became chaplain to the princeſs of Navarre. At the king of England's deſire he came to England in 1615, and prepared a plan for the union of the Proteſtant churches. The univerſity of Leyden offered him a profeſſorſhip of divinity in 1619: but he refuſed it, and preſided at the ſynod held by the Calviniſts at Alais in 1620 Some time after, being informed by Mr Drelincourt that the French king reſolved to have him thrown into priſon, he retired to Sedan, where the duke de Bouillon made him profeſſor of divinity, and miniſter in ordinary. He was employed by the Calviniſts in the moſt important affairs; and died at Sedan in 1658. His principal works are, 1. The anatomy of Arminianiſm. 2. A treatiſe on repentance, and the keys of the church. 3. The capuchine, or the hiſtory of thoſe monks. 4. The buckler of faith, or a defence of the reformed churches. 5. The judge of controverſies and traditions. 6. The anatomy of the maſs. 7. The novelty of Popery.

Peter du Moulin, his eldeſt ſon was chaplain to Charles II. of England, and prebendary of Canterbury, where he died in 1684, aged 84. He wrote, 1. The peace of the ſoul, in French. 2. *Clamor regii ſanguinis;* which Milton, by miſtake, attributed to Alexander Morus. 3. A defence of the Proteſtant religion, in Engliſh.

MOULINET, is uſed in mechanics, to ſignify a roller, which, being croſſed with two levers, is uſually applied to cranes, capſtans, and other ſorts of engines of the like nature, to draw ropes, and heave up ſtones, &c.

Moulinet is alſo a kind of turnſtile, or wooden croſs, which turns horizontally upon a ſtake fixed in the ground; uſually placed in paſſages to keep out horſes, and to oblige paſſengers to go and come one by one. The moulinets are often ſet near the outworks of fortified places at the ſides of the barriers, through which people paſs on foot.

MOULINS, a town of France, and capital of Bourbonnois. The houſes of the Chartreux, and that of the Viſitation, are magnificent. It carries on a conſiderable trade in cutlery ware, and is ſeated on the river Allier, in a pleaſant fertile plain, almoſt in the middle of France, 30 miles ſouth of Nevers, and 55 north of Clermont. E. Long. 3. 25. N. Lat. 46. 34.

MOULTON (North), a town of Devonſhire on the river Mole, and the north ſide of South Moulton, of whoſe hundred it is a member, and anciently gave name to it, as the latter does now. It has two fairs, on Tueſday after May 11, and on Nov. 12.

Moulton (South) on the ſame ſtream, 182 miles from London. This, as well as the former, was anciently a royal demeſne. This corporation, which once ſent members to parliament in the reign of Edward I. conſiſts of a mayor, 18 capital burgeſſes, a recorder, town-clerk, and 2 ſerjeants at mace. Here is a market on Saturdays; and fairs are held the firſt Tueſday after May 11, and Nov. 12. Their chief manufactures are ſerges, ſhalloons, and felts; and great quantities of wool brought from the country are bought up here every Saturday. In the year 1634, a merchant of London, a native of this town, built and endowed a free-ſchool here; beſides which, here is a charity-ſchool.

MOULTING, or Molting, the falling off or change of hair, feathers, ſkins, horns, or other parts of animals, happening in ſome annually, in others only at certain ſtages of their life.

The generality of animals moult in the ſpring. The moulting of a hawk is called *mewing*. The moulting of a deer is the quitting of his horns in February or March. The moulting of a ſerpent is the putting off his ſkin. See Exuviæ.

MOUND, a term uſed for a bank or rampart, or other fence, particularly that of earth.

Mound, in heraldry, a ball or globe with a croſs upon it, ſuch as the Britiſh kings are uſually drawn with, holding it in their left hand, as they do the ſceptre in the right.

MOUNT, an elevation of earth, called alſo *mountain*. See Mountain.

Mount-Edgecumbe, a prodigious high peak, at the entrance of Cook's ſtrait, in New Zealand, on the weſt ſide. Its height is ſuppoſed not to be much inferior to that of the peak of Teneriffe.

Mount-Sorrel, a town in Leiceſterſhire, ſo named from a high mount or ſolid rock adjoining to the town, of a duſky red or ſorrel-coloured ſtone, extremely hard. Of rough ſtones hewn out of this rock the town is built. It has a market on Mondays. It was noted formerly for its caſtle, and is ſeated on the river Stour, over which there is a bridge. It is 20 miles ſouth-eaſt by ſouth of Derby, and 105 north-weſt by north of London. W. Long. 1. 9. N. Lat. 52. 45.

Mounts of Piety, certain funds or eſtabliſhments in Italy, where money is lent out on ſome ſmall ſecurity. There were alſo mounts of Piety in England, raiſed by contribution for the benefit of people ruined by the extortions of the Jews.

MOUNTAIN *(Mons)*, a conſiderable eminence of land, elevated above every thing adjoining to it, and commanding all the ſurrounding places: It is commonly full of inequalities, cavities more or leſs expoſed, and ſtrata half laid open.

This name is likewiſe given to a chain of mountains; as when we ſpeak of Mount Atlas in Africa; Mount Caucaſus, which begins above Colchis and ends at the Caſpian ſea; the Pyrenean mountains, which ſeparate France from Italy; and the Appenine mountains, which run through the whole of Italy.

Thoſe who have ſurveyed the earth in general, and ſtudied nature on a grand ſcale, have conſtantly been ſtruck with admiration and aſtoniſhment at the ſight of ſuch majeſtic eminences, which extending in different ways, ſeem to rule over the reſt of the globe, and which preſent to the beholder a ſpectacle equally magnificent and intereſting. In them it has been ſuppoſed we muſt ſearch for a ſolution of the important problem regarding the creation of the world.

Naturaliſts reckon ſeveral kinds of mountains: we ſhall find that theſe elevations of the earth have not all the ſame origin, nor date their commencement from the ſame era.

1. Thoſe mountains which form a chain, and which are covered with ſnow, may be conſidered as *primitive* or antediluvian. They are like majeſtic bulwarks ſcattered on the ſurface of the globe, and greatly exceed the other mountains in height. In general, their elevation is very ſudden, and their aſcent very ſteep and difficult. Their ſhape is that of a pyramid crowned with ſharp and prominent rocks, on which no verdure is to be ſeen, but which are dry, naked, and as it were ſtripped of their ſoil, which has been waſhed away by the rains, and which preſent an awful and horrible aſpect, ſufficient to impreſs the coldeſt imagination with terror. Theſe primitive mountains, which aſtoniſh the eye, and where wind only reigns, are condemned by nature to perpetual ſterility. At the foot of them we frequently find paths leſs ſteep and winding than when we aſcend to a greater height. They every where preſent thundering caſcades, frightful precipices, and deep valleys. The depreſſions and excavations correſpond with the quantity of water, the motion of which is accelerated in its fall, and which ſometimes produces a total ſinking or an inclination of the mountain. The wrecks to be found at the foot of moſt peaks, ſhow how much they have ſuffered from the hand of time. Nothing meets the eye but enormous rocks, heaped in confuſion on one another, which prevent the approach of the human race. On the ſummits of theſe mountains or high eminences, which are only a ſeries of peaks frequently detached from one another, the prominent rocks are covered with eternal ſnow and ice, and ſurrounded with floating clouds which are diſperſed into dew. In a word, the rugged cliffs oppoſe an inacceſſible rampart to the intrepidity of man; and nature exhibits a picture of diſorder and decay (A). No ſhells or other organized marine bodies are to be found in the internal part of theſe primitive mountains; and though ſearch has been made, by digging, on the tops of the Alps and the Pyrenees, no ſubſtances of this nature have yet been diſcovered except on the ſides near the baſe. Nothing is to be met with but continued rocks, caverns dug by the hand of nature, and abounding in cryſtallizations of great beauty, with various minerals. The ſtone of which they conſiſt is an immenſe maſs of quartz, ſomewhat varied, which penetrates into the bowels of the earth in a direction almoſt perpendicular to the horizon. We find no calcareous ſpar but in the fiſſures or rents which have ſome extent and an evident direction; and at great depths we find new parts as it were, or in other words, the primitive ſtate of things. All primitive mountains furniſh proofs of theſe aſſertions. Of this kind in Europe are the Pyrenees, the Alps, the Apennines, the mountains of Tirol, the mountain of the giants in Sileſia, the Carpathian mountains, the mountains of Saxony, thoſe of Norway, &c. In Aſia we find the Riphean mountains, Mount Caucaſus, Mount Taurus, and Mount Libanus; in Africa, the mountains of the moon; and in America the Apalachian mountains, and the Andes or Cordilleras. Many of the latter have been the ſeats of volcanoes.

2. Another kind of mountains are thoſe which are either detached, or ſurrounded with groups of little hills, the ſoil of which is heaped up in diſorder, and the cruſt gravelly and confuſedly arranged together. Theſe are truncated or have a wide mouth in the ſhape of a funnel towards the ſummit, and which are compoſed of, or ſurrounded with, heaps of calcined and half vitrified bodies, lava, &c. This claſs of mountains appear to have been formed by different ſtrata raiſed up and diſcharged into the air, upon occaſion of the eruption of ſome ſubterraneous fire. The iſles of Santorin, Monte-Nuovo, Mount Etna, Adam's Peak in the iſland of Ceylon, the peak of Teneriffe in the Canary Iſlands, and many others, have been formed in this manner. When very high mountains of this kind are covered with ſea-ſhells, we may conſider their ſummits as having once conſtituted a part of the bottom of the ocean. A number of theſe mountains have been formed in the memory of man, and preſent nothing to the view but diſordered ruins; confuſed maſſes, parts heaped together in the greateſt irregularity, and productions formed by eruptions or by the falling in of the earth. When a mountain of this

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(A) It is obſerved, ſays the Abbé Palaſſou, that at the foot of the Pyrenean mountains, the ſoil of ſeveral countries conſiſts wholly of the mud and rubbiſh depoſited by the rivers which deſcend from them. According to Herodotus, a great part of Egypt was in like manner formed by the different ſubſtances brought thither by the Nile: Ariſtotle calls it the work of the Nile; and on this account the Ethiopians boaſted that Egypt was indebted to them for its origin. The inhabitants of the Pyrenees might ſay the ſame thing of almoſt the whole tract of country ſituated along the northern chain from the ocean to the Mediterranean, forming that kind of iſthmus which ſeparates the two ſeas. The ſurface of our globe is thus in a ſtate of perpetual change; the plains are elevated, the mountains are levelled, and water is the principal agent employed by nature in theſe great revolutions. Time alone is wanting to verify the ſaying of Louis XIV. to his grandſon: Poſterity will one day be able to ſay, "The Pyrenees are no more." The period, however, muſt neceſſarily be very diſtant. M. Genſanne, from obſervations which he thinks well founded, concludes, that the mountains are lowered about ten inches every century. Suppoſing them therefore to be 1500 toiſes above the level of the ſea, and always ſuſceptible of being lowered in the ſame degree, a million of years would elapſe before their total deſtruction.

this kind is connected with the land, and advances farther into the ſea than the adjoining country, it is then termed a *Cape*, *Head*, or *Promontory*; ſuch as the Cape of Good Hope at the ſouthern extremity of Africa. Mountains of the ſecond rank are commonly more eaſy of acceſs. Dr Haller obſerves, that the angle formed between their baſe and their declivity is larger; that they have fewer ſprings; and that their plants are different from thoſe of the Alps. The peaſants in Swiſſerland, he tells us, are acquainted with the difference betwixt theſe two kinds of mountains.

3. Thoſe mountains, whether arranged in a group or not, the earth or ſtone of which is diſpoſed in ſtrata more or leſs regular, and conſiſting of one or more colours and ſubſtances, are produced by the ſubſtances depoſited ſlowly and gradually by the waters, or by ſoil gained at the time of great floods. We daily ſee little hills formed in this manner, which are always of a ſmall height compared with thoſe of the firſt order, and round in the top, or covered with ſoil frequently forming a pretty flat and extenſive ſurface. We there find likewiſe ſand and heaps of round pebbles like ſuch as have been worn by the waters. The internal part of theſe mountains conſiſts of a heap of ſtrata almoſt horizontal, and containing a prodigious quantity of ſhells, marine bodies, and fiſh-bones. Although theſe mountains formed by ſtrata ſometimes degenerate into little hills, and even become almoſt flat, they always conſiſt of an immenſe collection of foſſils of different kinds, in great preſervation, and which are pretty eaſily detached from their earthy bed whether harder or ſofter. Theſe foſſils, conſiſting of marine ſhells intermixed and confounded with heaps of organiſed bodies of another ſpecies, preſent a picture of aſtoniſhing diſorder, and give indubitable indications that ſome extraordinary and violent current has confounded and accumulated in the greateſt diſorder and precipitation foreign ſubſtances and ſhells of various kinds. Theſe, removed from their natural and original place, by their union form an elevation and a mountain, which are in fact nothing but a compoſition of the wrecks of bodies formerly organiſed. All theſe phenomena ſeem to prove, that moſt of theſe mountains chiefly owe their origin to the ſea, which once covered ſome parts of our continent, now left dry by its retreat. (According to the principles of this ſyſtem, Anaxarchus explained the formation of the mountains of Lampſacus). In theſe mountains we likewiſe find wood, prints of plants, ſtrata of clay, marl, and chalk, different beds of ſtone ſucceeding one another, ſuch as ſlate, marble which is often full of ſea ſhells, lime-ſtone which appears to be wholly formed from the wreck of ſhells, plaſter-ſtone, entire ſtrata of ochre, and beds of bitumen, mineral ſalt, and alum.

The ſtrata of mountains which are lower and of a recent date, or formed by recent accidents, ſometimes appear to reſt upon, or to take their riſe, from the ſides of primitive mountains which they ſurround, and of which they in ſome meaſure form the firſt ſteps in the aſcent; and they end by being inſenſibly loſt in the plains. With reſpect to the irregularity of ſome ſtrata in recent mountains, it is owing to violent and ſudden inundations, to torrents, and to local revolutions which have produced angles, leaps, and ſinkings down of the ſtrata. It is generally obſerved, however, that the ſtrata in mountains are exactly parallel to each other throughout all their different windings. M. Deſmareſt remarks, that in two mountains which by their brows form the hollow of a valley, we find ſtrata of earth or ſtone of the ſame kind, and diſpoſed and arranged in the ſame manner. We have already ſhown, under the article EARTH, why the ſtrata of recent mountains are not every where the ſame in number and thickneſs. Some ſtrata are only a quarter of an inch thick, others are more than ten feet: in ſome places we find 30 or 40 beds ſucceeding each other, in others only three or four. In recent mountains compoſed of ſtrata, M. Lehmann obſerves, the loweſt ſtratum is always pit-coal; and this reſts on a coarſe and ferruginous gravel or ſand. Above the pit-coal we find ſtrata of ſlate, ſchiſtus, &c. and the upper part of the ſtrata is conſtantly occupied by limeſtone and ſalt-ſprings. It is eaſy to perceive the utility of theſe obſervations, when we intend to work for theſe minerals; and by attending to the diſtinction which has been made of the different mountains of the ſame kind, we may know the nature of thoſe ſubſtances which upon ſearch we may expect to find in them. The ſpecimens which appear without, indicate what ſubſtances are concealed within.

In general, it has been obſerved, that when two or more mountains run parallel to each other, the ſalient angles correſpond with the receding ones; and theſe angles are ſharper and more ſtriking in deep and narrow valleys. Dr Haller obſerves, that there are many places in the Alps and in mountains, where two chains are prolonged contrary to the axis of the valley, and join ſo as only to leave as much ſpace as is neceſſary for the diſcharge of the water. In other places the mountain is continued, for inſtance, to the north, and diſcontinued to the ſouth, where it opens into a valley. In others, the two chains retire and form a bend on each ſide, the concavity of which fronts the axis; hence ariſe valleys almoſt round and completely united.

It is likewiſe worthy of obſervation, that primitive mountains which form vaſt chains are commonly connected together; that they ſucceed one another for a ſpace of ſeveral hundred leagues; and cover with their principal branches, and their various collateral ramifications, the ſurface of continents. Father Kircher and many others have obſerved, that the principal chain generally runs from ſouth to north, and from eaſt to weſt. The Cordilleras in the New world, Dr Haller obſerves, extend from north to ſouth; the Pyrenees have nearly the ſame direction; the Alps run from eaſt to weſt; and there muſt be a chain of this kind in Africa, for the great rivers in that quarter of the world run to the eaſt on the one ſide and to the weſt on the other. The chain of Thibet appears to be parallel to the Alps; and, from the great length of the road through the ſnows, it may be inferred that the mountains of Thibet have a very great elevation. Thoſe mountains which, ſtrictly ſpeaking, are the principal roots, and the capital point of elevation and diviſion, preſent very conſiderable maſſes, both with regard to their height and their ſize or extent: they commonly occupy and traverſe the centre of continents.

Thoſe which have a ſmaller elevation ariſe from theſe principal chains; they gradually diminiſh in proportion to their diſtance from their root, and at length wholly diſappear either on the ſea-coaſt or in the plains. Others are continued along the ſhore of the ſea; their chain is interrupted only to make room for the waters of the ocean, under the bed of which the baſe of theſe mountains extends; and it again occurs in iſlands, which perpetuate their continuation till the whole chain re-appears The higheſt mountains and the greateſt number of iſlands are generally found between or near the tropics, and in the middle of the temperate zones; while the loweſt are adjacent to the poles; though this does not always hold good without exception. M. Buache, a member of the Academy of Sciences at Paris, has laid down a ſyſtem of phyſical geography concerning the ſtructure of the terraqueous globe, conſidered with reſpect to the great chains of mountains which croſs the continents and ſeas from pole to pole, and from eaſt to weſt. According to this ſyſtem, there is an uninterrupted ſeries of mountains and high grounds which divide the earth into four declivites, from which the rivers deſcend. Theſe chains of mountains are continued from one continent to another under the ocean; and the iſlands which are obſerved in it, are as it were the ſummits of the mountains. M. Buache's work is entitled *Tables et Cartes de la Geographie phyſique*. But that this ſyſtem, with regard to the iſlands, muſt be erroneous, will appear evident from our article Earth.

In the *Journal de Phyſique* for May 1779, we are informed, that Dr Pallas, who has travelled through Siberia, and almoſt all the Ruſſian empire in the north of Aſia, thinks he has diſcovered the inſufficiency of the principal ſyſtems hitherto propoſed to account for the formation of mountains. This accurate obſerver has proſecuted the ſtudy of mountains by traverſing immenſe regions, and viſiting as it were the ſecret work ſhops of nature in almoſt the fourth part of our hemiſphere. He has not truſted to the vague reports of others, but from obſervations which he himſelf had occaſion to make for the ſpace of ten years; he has, in a work entitled *Obſervations on Mountains*, explained both the direction of the northern chains, and the particular compoſition of each. He is thence led to make an ingenious conjecture concerning the formation of the principal groups of mountains, and concerning the irregular diſtribution and the figure of the whole continent. Under the article Earth an account is given of the different ſyſtems which have been formed concerning the formation and configuration of our globe. To eſtabliſh a general ſyſtem, it would perhaps be neceſſary to have travelled over the whole earth; and to have ſtudied all the chains of mountains, their direction, and particular compoſition, for a long ſeries of years. Thus very little attention is required to perceive, in the different ſyſtems mentioned under the article Earth, the influence of climate and local ſituation. Burnet, Whiſton, and Woodward, who were acquainted only with England, where very few great chains of mountains are to be ſeen, where they are almoſt all inſulated or detached, and where the ſoil of extenſive plains is formed by horizontal and pretty regular ſtrata, naturally thought that theſe general and concentric ſtrata were to be found all around the globe; and conſidered mountains as nothing but the wreck of theſe ſtrata, either raiſed or ſwallowed up by the violence of the waters. Scheuchzer, who ſtudied among the ſteep mountains of Switzerland, amid rocks of granite, petroſilex, jaſper and hard ſtones, and who found nothing on the moſt elevated plains of the Alps but ſtrata of ſimilar ſubſtances, had recourſe to the power of the Almighty, who broke in pieces theſe ſtrata, and elevated their ſplinters into the form of mountains. Ray, Morro, and Stenon, who ſaw nothing all around them but burning mountains and traces of volcanic productions—deceived by the conſtitution of the hills of Italy, which are almoſt all formed of lava, pozzolana, and baſaltic ſubſtances, and by the origin of the Monte Nuovo, which roſe up almoſt before their eyes, have conſidered great mountains as formed by a cauſe which undoubtedly has a ſecondary, but to which they have aſcribed a primary and principal, influence. M. de Buffon, who delineated nature at the foot of the utmoſt extremity of the French Alps, and who perceived them gradually attain a greater elevation as they advanced towards the ſouthern parts of France and towards Savoy, concluded from his theory, and in ſupport of the ſame theory, that the higheſt mountains were near the equator; that they became lower towards the poles; and that, being produced by the flux and reflux of the ſea, they were formed of the ſubſtances which it depoſited.

We ſhall now lay before our readers the geographical deſcription of the directions of the principal mountains, and of that kind of connection which ſubſiſts betwixt them. This deſcription differs from that of M Buache, and may be read with a map of the world before us.

M. Buache places the moſt elevated points of the great chain of mountains under the equatorial line: but according to the author whom we follow in this place, the fulleſt and moſt continuous lands, and perhaps likewiſe the moſt elevated, are to be found at a diſtance from the equator, and towards the temperate zones. If, in fact, we ſurvey the globe's ſurface, we will not be able to perceive that chain of mountains, which running from eaſt to weſt, and dividing the earth into two portions, ought again to meet. On the contrary, extenſive plains ſeem to accompany the line through almoſt its whole extent. In Africa, the deſerts of Nigritia and thoſe of Upper Ethiopia, are on the one ſide of the line; and on the other are the ſandy plains of Nicoco, Caffraria, Monoemugi, and Zanguebar. From the eaſtern ſhores of Africa to the Sunda iſlands, is a ſpace of 1500 leagues of ſea with almoſt no iſlands, except the Laccadive and Maldive iſlands; moſt part of which have little elevation, and which run from north to ſouth. From the Molucca iſlands and New Guinea, to the weſtern borders of America, the ſea occupies a ſpace of 3000 leages. Though Chimboraco and Pichincha in America, the two higheſt mountains which have been meaſured, are near and even under the line, yet from this no concluſion can be drawn; becauſe on one ſide theſe mountains run in a direction not parallel to the equator; the Andes or Cordilleras attain a greater elevation as they remove from the equator towards the poles; and a vaſt plain is found exactly under the line, between the Oronooko and the river of the Amazons. Beſides, the latter river, which takes its riſe in the province of Lima about the 11th degree of ſouth latitude, after croſſing the whole of South America from weſt to eaſt, falls into the ocean exactly under the equator. This ſhows that there is a deſcent for the ſpace of 12 degrees or 300 leagues. From the mouth of the river of the Amazons, to the weſtern ſhores of Africa, the ſea forms another plain of more than 50 degrees.

From the few certain facts and accurate obſervations which we have received from well informed travellers, we might almoſt affirm that the moſt elevated land on our globe is ſituated without the tropics in the northern and ſouthern hemiſphere. By examining the courſe of the great rivers, we in fact find that they are in general diſcharged into three great reſervoirs, the one under the line, and the other two towards the poles. This, however, we do not mean to lay down as a thing univerſally true, for it is allowed, that, beſides the two elevated belts, the whole ſurface of the earth is covered with innumerable mountains, either detached from one another or in a continued chain. In America, the Oronooko and the river of the Amazons run towards the line, while the river St Lawrence run towards the 50th degree of north latitude, and the river de la Plata towards the 40th degree of ſouth latitude. We are ſtill too little acquainted with Africa, which is almoſt all contained within the tropics, to form any accurate concluſions concerning this ſubject. Europe and Aſia, which form only one great maſs, appear to be divided by a more elevated belt, which extends from the moſt weſterly ſhores of France to the moſt eaſterly of China, and to the iſland of Sagalen or Anga-hata, following pretty nearly the 50th degree of north latitude. In the new continent, therefore, we may conſider that chain where the Miſſiſſippi, the river St Lawrence, the Ohio, and the river de los Eſtrechos, take their riſe, as the moſt elevated ſituation in North America; whence the Miſſiſſippi flows towards the equator, the river St Lawrence towards the north-eaſt, and the reſt towards the north-weſt. In the old continent, the belt formerly mentioned, and to which we may aſſign about 10 degrees in breadth, may be reckoned from the 45th to the 55th degree of north latitude; for in Europe the Tagus, the Danube, the Dnieper, the Don, and the Volga, and in Aſia the Indus, the Ganges, the Meran, the Mecon, the Hoang-ho, and the Yantg-tſe-Kiang, deſcending as it were from this elevation, fall into the great reſervoir between the tropics; whilſt towards the north the Rhine, the Elbe, the Oder, the Viſtula, the Obi, the Jeniſei, the Lena, the Indigirka, and the Kowyma, are diſcharged into the northern reſervoir.

Judging from theſe mountains the height of which has been calculated, and from the immenſe chains with which we are acquainted, we may infer that the higheſt mountains are to be found in this elevated belt. The Alps of Swiſſerland and Savoy extend through the 45th, the 46th, and the 47th degrees. Among them we find St Gothard, Furca, Bruning, Ruſs, Whiggis, Scheidek, Gunggels, Galanda, and laſtly that branch of the Swiſs Alps which reaches Tirol by the name of Arlenberg and Arula. In Savoy, we meet with Mount Blanc, the Peak of Argentiere, Cornero, Great and little St Bernard, Great and Little Cenis, Coupeline, Servin, and that branch of the Savoyard Alps which proceeds towards Italy through the duchy of Aost and Montferrat. In this vaſt heap of elevated peaks, Mont Blanc and St Gothard are particularly diſtinguiſhed. The Alps, leaving Swiſſerland and Savoy, and paſſing through Tirol and Carniola, traverſe Saltzbourg, Stiria, and Auſtria, and extend their branches through Moravia and Bohemia, as far as Poland and Pruſſia. Between the 47th and 48th degrees, we meet with Grimming the higheſt mountain of Stiria, and Priel which is the higheſt in Auſtria. Between the 46th and 47th degrees, the der Bacher and the der Reinſchnicken, form two remarkable chains. The upper one, which traverſes the counties of Trencſin, Arrava, Scepus, and the Kreyna, ſeparates Upper Hungary from Sileſia, Little Poland, and Red Ruſſia; the inferior one traverſes Upper Croatia, Boſnia, Servia, and Tranſylvania, ſeparates Upper Hungary from Turkey in Europe, and meets the upper chain behind Moldavia, on the confines of Little Tartary. In theſe mountains are ſituated the rich mines of Schemnitz.

To form a general idea of the great height of this Alpine belt, it is neceſſary only to remark, that the greateſt depth of the wells at Schemnitz is 200 toiſes; and yet it appears from the barometrical calculations of the learned M. Noda, that the greateſt depth of theſe mines is 286 toiſes higher than the city of Vienna. The granito-argillous mountains of Schemnitz, and of the whole of this metallic diſtrict, are inferior, however, to the Carpathian mountains. Mount Krivany in the county of Arrava, and the Carpathian mountains between Red Ruſſia and the Kreyna, appear by their great elevation to rule over the whole of the upper Alpine chain. In the inferior chain we likewiſe meet with mountains of an extraordinary height; among others, Mount Mediednik, which gives its name to a chain extending far into Boſnia; and Mount Hemus, celebrated even among the ancients. In ſhort, this extenſive chain reaches into Aſia, and is there confounded with another chain no leſs famous, which, following exactly the 50th degree of latitude, runs through the whole of Aſia. This chain of mountains is deſcribed by Dr Pallas in the work abovementioned; and we ſhall now trace its courſe in company with this intelligent obſerver.

This author places the head of the mountains of Oural, between the ſources of the Taik and the Bielaia, about the 53d degree of latitude, and the 47th of longitude. Here the European Alps, after having traverſed Europe, and ſent of various branches which we ſhall afterwards examine, loſe their name, which is changed into that of the Ouralic or Uralian mountains, and begin their courſe in Aſia. This lofty chain, which ſeparates Great Bulgaria from the deſarts of Iſchimſka, proceeds through the country of the Eleuths, follows the courſe of the river Irtis, approaches the lake Teleſkaia, and afterwards forms a part of the ſame ſyſtem of mountains with the Altaic chain. There they give riſe to the Oby, the Irtis, and the Jeniſei, which begin their courſe about the 50th degree of north latitude, and fall into the Frozen Ocean.

The Altaic chain, after having embraced and united all the rivers which ſupply the Jeniſei, is continued under the name of *Saianes*, without the ſmalleſt interruption, as far as the Baikal lake. The extenſion of this chain to the ſouth forms that immenſe and elevated plain which is loſt in Chineſe Tartary, which may be compared with the only plain in Quito, and which is called *Gobi* or *Chamo*. The Altai afterwards interpoſing between the ſource of the Tchikoi and of the rivers which ſupply the Amur or Sagaleen, riſes towards the Lena, approaches the city Jakuck beyond the 60th degree of latitude, runs from that to the ſea of Kamtſchatka, turns round the Ochockoi and Penſink gulphs, joins the great marine chain of the Kurile iſles near Japan, and forms the ſteep ſhores of Kamtſchatka, between the 55th and 60th degrees of latitude. Such is the direct courſe of the high mountains conſtituting the belt which, we imagine, is to be found in the northern hemiſphere, and which, after becoming lower, paſſing under the ſea, and forming by means of their elevated peaks that archipelago of iſlands which derives its name from the unfortunate Bhering, again riſe and enter North America, on the weſtern ſide, about the Straits of Anian. After running in the ſame parallel, and giving riſe to the Ohio, the Riviere-Longue, the river St Lawrence, and the Miſſiſſippi, they are loſt in Canada. From the eaſtern ſhores of America to the weſtern ſhores of Europe, we find a vaſt interruption. Perhaps the chain was at firſt continued completely round the globe; but extraordinary revolutions, by ſeparating the old and new continents, may have occaſioned this diviſion, and left nothing but the Azores and ſome detached points as a monument of what formerly exiſted, till we come to the Britiſh iſles.

Before we proceed to inquire whether a belt of a ſimilar elevation exiſts in the ſouthern hemiſphere, we may remark thoſe branches and ramifications which the great northern Alpine belt ſends forth both towards the equator and the antarctic pole. Theſe new chains, which gradually become lower as they approach the boundary towards which they tend, appear a ſufficient proof that the equator is not the moſt elevated part of the earth.

The European Alps produce three principal chains, which run towards the equator; and ſome ſmaller ones running towards the pole. The firſt ſouthern chain is ſent out through Dauphiné; traverſes Vivarais, Lyonnois, Auvergne, Cevennes, and Languedoc; and, after joining the Pyrenees, enters Spain. There it divides into two or three ramifications, one of which runs through Navarre, Biſcay, Arragon, Caſtile, Marche, and Sierra Morena and extends into Portugal. The other, after traverſing Andaluſia and the kingdom of Grenada, and there forming a number of ſierras, again makes its appearance, beyond the Straits of Gibraltar, in Africa, and coaſts along its northern ſhores under the name of *Mount Atlas*.—The ſecond principal chain of the Alps paſſes out through Savoy and Piedmont; ſpreads its roughneſſes over the ſtates of Genoa and Parma; forms the belt of the Apennines; and after frequently changing its name, and dividing Italy into two parts, terminates in the kingdom of Naples and in Sicily, producing volcanoes in every part of its courſe. The third chain is ſent off from Hungary, and ſcatters innumerable mountains over all Turkey in Europe, as far as the Morea and the Archipelago at the bottom of the Mediterranean ſea. The northern branches, though ſmaller at firſt, are no leſs clearly defined; and ſome of them even extend their ramifications as far as the Frozen Ocean. An Alpine branch, iſſuing from Savoy thro' the country of Gex, proceeds through Franche-Comte, Suntgaw, Alſace, the Palatinate, and Veterabia.—Another iſſues from the territory of Saltzbourg, paſſes along Bohemia, enters Poland, ſends off a ramification into Pruſſia towards the deſerts of Waldow, and after having paſſed through Ruſſia is loſt in the government of Archangel.

The Aſiatic Alps ſend forth in like manner ſeveral branches both to the ſouth and north. The Ouralic mountains, between the ſources of the Bielaia and the Jaik, produce three principal branches; the firſt of which, including the Caſpian Sea in one of its diviſions, enters Circaſſia through the government of Aſtracan, paſſes through Georgia under the name of *Caucaſus*, ſends a vaſt number of ramifications to the weſt into Aſiatic Turkey, and there produces the mountains Tſchilder, Ararat, Taurus, Argée, and many others in the three Arabias; while the other diviſion, paſſing between the Caſpian Sea and the lake Aral, penetrates through Choraſan into Perſia. The ſecond branch, taking a more eaſterly direction, leaves the country of the Eleuths; reaches Little Bucharia; and forms the ramparts of Gog and Magog, and the celebrated mountains formerly known by the name of *Caf*, which M. Bailly has made the ſeat of the war between the Dives and the Peris*. It traverſes the kingdoms of Caſgar and Turkeſtan, enters through that of Lahor into the Mogul territory, and, after giving riſe to the elevated deſert of Chamo forms the weſtern peninſula of India. While theſe two branches run towards the ſouth, the third branch of the Ouralic chain riſe towards the north, following almoſt the 79th degree of longitude, and forms a natural boundary between Europe and Aſia; without, however, bounding the immenſe empire of Ruſſia. This chain, after coming oppoſite to Nova Zembla, divides into two conſiderable branches. The one, running to the north-eaſt, paſſes along the Arctic ſhores; the other, proceeding towards the north-weſt, meets the northern European chain, traverſes Scandinavia in the ſhape of a horſeſhoe, covers the low-lands of Finland with rocks; and, as is obſerved by Dr Pallas, appears to be continued from the North Cape of Norway through the marine chain of Spitzbergen, ſcattering iſlands and ſhelves perhaps throughout the northern ocean, that, paſſing through the pole, it may join the northern and eaſtern points of Aſia and North America.

The Ouralic, which in the country of the Mongols becomes the Altaic chain, proceeds towards the equator. After forming the mountains and caverns wherein, as we are told, the aſhes of the Mongol emperors of the race of Ghengis-Kan are depoſited, together with the vaſt plain of Chamo, conſiſting of arid ſand, and the frightful rocks and precipices of Thibet, which form the myſterious and deſert retreats of the Grand Lama, it croſſes the rivers Ava and Menan; contains in its ſubdiviſions the kingdoms of Ava, Pegu, Laos, Tonquin, Cochinchina, and Siam; ſupports the peninſula of Malacca; and overſpreads the Indian ocean with the iſles of Sonda, the Moluccas, and the Philippines, From the borders of the Baikal lake and of the province of Selinginſkoy,

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* Letters ſur les Atlantides, let. 16.

ginſkoy, a branch is detached, which ſpreads over Chineſe Tartary and China, is continued into Corea, and gives riſe to the iſlands of Japan.

The great chain having extended to the north, near the city of Jakuck, upon the banks of the Lena, ſends off one of its branches to the north-weſt, which paſſing between the two Tunguſta, is loſt in marſhy grounds lying in the northern parts of the province of Jenniſſeiſkoy. The ſame chain, after it has reached the eaſtern part of Aſia, is loſt in the icy regions of the north about Nos-Tſchalatſkoy or the icy Promontory, and Cap Czuczenſkoy.

It will be more difficult, perhaps, to trace the elevated belt in the ſouthern hemiſphere beyond the tropic of Capricorn, than it has been to diſtinguiſh that towards the north. An immenſe extent of ocean ſeems to occupy the whole Antarctic part of the globe. The greateſt ſouth latitude of the old continent is not more than 34 degrees, and South America ſcarcely extends to the 55th degree. In vain has the enterpriſing Cook attempted to diſcover regions towards the pole: his progreſs was conſtantly interrupted by tremendous mountains and fields of ice. Beyond the 50th degree no land and no habitation is to be found. The iſlands of New Zealand are the fartheſt land in theſe deſert ſeas; and yet the ſouth cape of Taral-Poenamoo extends only to the 48th degree: We do not mention Sandwich-land, which is ſituated in the 58th degree, becauſe it is too ſmall and too low. It muſt be recollected, however, that according to the declarations of travellers, the Cordilleras become higher as they advance ſouthward to the Straits of Magellan; and that the Terra del Fuego, which lies in the latitude of 55, is nothing but a maſs of rocks of prodigious elevation. America, however, exhibits to our view elevated points, whence chains of mountains are diſtributed in different directions over the whole ſurface of the new continent. There muſt likewiſe be great reſervoirs, where the moſt remarkable rivers take their riſe, and from which they neceſſarily deſcend towards their mouth. In the ſouthern hemiſphere, this elevated belt is nearer the equator; and though it does not extend to the 50th degree, it is evidently to be met with and may be accurately traced between the 20th and 30th degrees. The high mountains of Tucuman and of Paraguay, which interſect South America about the 25th degree of latitude, may be conſidered as the American Alps. If we look into the map of the world, we will be able to diſtinguiſh an elevated belt all along this parallel. In Africa, Monomotapa and Caffraria are covered with very high mountains, from which pretty large rivers deſcend. In the Pacific Ocean, we find New Holland, New Caledonia, the New Hebrides, and the Friendly and the Society iſlands, under the ſame parallel. We may, therefore, with ſufficient propriety, diſtinguiſh this parallel by the name of the *Southern Alps*, as we have already diſtinguiſhed the elevated belt of the 50th degree of north latitude by that of the *Northern Alps*. In America, the Rio de la Plata, which after a courſe of 500 leagues falls into the ocean at the 35th degree of ſouth latitude; the Pavana, which riſes from the mountains of the Arapes, and falls into the Plata at Corriente; the great number of rivers which flow into that of the Amazons, ſuch as the Paraba, which receives in its courſe the tribute of more than 30 other rivers; the Madera, the Cuchirara, the Ucayal, &c. &c. all deſcend from theſe ſouthern Alps. From theſe Alps likewiſe three conſiderable branches of mountains are detached, which go by the common name of *Andes* or *Cordilleras*.—The firſt branch, which extends towards the ſouth, and paſſes out from Paraguay through Tucuman, ſeparates Chili from theſe provinces and from Chimito, and is continued through the Terra Magellanica as far as Terra del Fuego. The ſecond branch, directing its courſe towards the equator, traverſes Peru, in vain endeavouring to conceal treaſures which the avarice of men has taught them to diſcover in its bowels; bounds the Spaniſh Miſſions; enters Terra Firma thro' Popayan; and unites South and North America by the iſthmus of Panama. The third diviſion, iſſuing from Paraguay through Guayra and the territory of Saint-Vincent, traverſes Brazil, diſtributes ramifications into Portugueſe, French, and Dutch Guiana, croſſes the Oronooko, forms the mountains of Venezuela, and near Carthagena meets the ſecond branch coming from Popayan.

We have already ſuppoſed, that the elevated belt of North America was ſituated about the 45th degree of north latitude; and there we imagined we recognized the continuation of the northern Alps of the old continent. This chain likewiſe ſends forth conſiderable branches on both ſides. One of them is detached acroſs the ſources of the Miſſiſſippi, the Belle-Riviere, and the Miſſouri, and at the entrance of New Mexico divides, in order to form California to the weſt, and the Apalachian mountains to the eaſt.—Thence proceeding through New Biſcay, the audience of Guadalaxara, Old Mexico, and Guatimala, it meets at Panama the ſouthern branch, which is part of the Alps of Paraguay. The ſecond branch, following the courſe of the Miſſiſſippi, ſeparates Louiſiana from Virginia; ſerves as a bulwark to the United States of America; forms the Apalachian mountains in Carolina; and at laſt, traverſing Eaſt Florida, incloſes the Gulph of Mexico with the Great and Little Antilles. In the north, we can trace the branches of the elevated belt; on one ſide obſerve them proceeding towards Canada, directing their courſe through Labrador to Hudſon's Straits, and at length confounded with the rocks of Greenland, which are covered with eternal ſnow and ice. On the other ſide, we ſee them riſing through the country of the Aſſinipoels and the Kriſtinos, as far as Michinipis and the northern Archipelago.

We have thus traced the directions of the great chains of mountains. There are certain projecting and pretty ſenſible points on the Globe, which appear to ſupply every region with great rivers and high mountains. The Alps of Switzerland and Savoy in Europe, the union of the Ouralic mountains in Aſia; (B) the Andes of Tucuman and Paraguay in South America, and the high countries, whence the Miſſiſſippi,

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(B) Theſe M. Bailly conſiders as the moſt elevated part of the globe. *Lettres ſur les Atlantides*, p. 236.

ſſippi, the river Saint Lawrence, and the Belle Riviere deſcend, may be conſidered as ſome of theſe; though M. Buache places them much nearer the equator, and even under the line. But his object was to form a ſyſtem to ſupport his own, and to confirm another; ours is merely to ſtate what we have obſerved, and what indeed muſt occur to every one who ſurveys the ſurface of the globe as it is delineated by our beſt geographers.

So many obſervations fully ſhow that the primitive mountains may be conſidered as the foundation of our globe. By their ſhape, elevation, direction, and continuity, they give riſe to the greateſt part of winds, or produce that variety which prevails among them. Primitive mountains, as we have already ſaid, are diſtinguiſhed likewiſe by their internal ſtructure, by the nature of the ſtones of which they are compoſed, and by the minerals which they contain. The higheſt mountains are, properly ſpeaking, nothing but peaks or cones conſiſting of ſolid rock. This pyramidal form has been ſuppoſed to be at firſt owing to a kind of cryſtallization; and the late M. Rouelle was of opinion, that the ſubſtances of which our globe is compoſed originally ſwam in a fluid. The ſimilar parts of which the great mountains conſiſt, according to this philoſopher, approached one another and formed a cryſtallization, ſometimes in a group, and at other times detached at the bottom of the waters. Upon this ſuppoſition, we might analyſe different portions or blocks of rock taken from primitive mountains; and by making them cryſtalliſe, we would then have in miniature a part of the ſame economy or connection of mountains, a figurative portion, in ſhort, of the ſkeleton of the earth.— We may farther preſume, that thoſe ſteep rocks which it now ſeems almoſt impoſſible to ſurmount even in imagination, are co-eval with the exiſtence of the world.

Mountains with flat ſummits ſometimes reſt on the baſe of primitive mountains; and contain marble, foſſils, and limeſtone. When mountains of the ſame kind poſſeſs a round and more regular ſhape, they conſiſt of chalk and other calcareous and friable ſubſtances arranged in ſtrata, Granite-argillous mountains, like thoſe of Shemnitz, generally form metallic diſtricts. Hills compoſed of brown free-ſtone every where preſent irregular points, indicating broken ſtrata and heaps of rubbiſh.

Dr Pallas (in the ſyſtematic part of the Memoir above mentioned, concerning the ſubſtances of which the higheſt mountains are compoſed) lays it down as an axiom, that the higheſt mountains of the globe forming continued chains, are compoſed of that rock which is called *granite*, the baſe of which is always a quartz, with a greater or ſmaller mixture of felt-ſpar, mica, and ſmall ſchoerls, ſcattered without order, and in irregular fragments of different ſizes. This old rock, and the ſame ariſing from its decompoſition, form the baſe of all continents. Granite is found below mountains compoſed of ſtrata (this obſervation is not applicable to the courſes of mountains formed by ſtrata); it conſtitutes the large protuberances, and as it were the heart, of the greateſt Alps in the known world: hence we may with the greateſt probability infer, that this rock forms the principal ingredient in the internal compoſition of our globe. It is never found in regular ſtrata, but in huge maſſes and in ſhapeleſs blocks; its origin is prior to that of all animated beings; it exhibits not the ſmalleſt traces of petrifaction, and ſeems not to have received the leaſt impreſſion from any organiſed ſubſtance. High eminences, whether in continued chains or in the form of ſteep peaks, are never covered with clayey or calcareous ſtrata, deriving their origin from the ſea; but appear to have been from their very firſt formation elevated above the level of the ocean. The ſides of theſe great chains are for the moſt part covered with ſchiſtous belts, and ſurrounded with mountains of the ſecond and third orders. This is proved by the Ouralic and Altaic chains, which have been traced by Dr Pallas. Such is the ſyſtem propoſed by this author. The high or primitive and ancient mountains, which have exiſted from the beginning of time, are granitous; the ſchiſtous mountains, to which he gives the name of *ſecondary*, have ariſen from the ſides of the primitive by the decompoſition of the granite; and thoſe which he calls *tertiary* mountains, or mountains of the third order, are nothing but ſubſtances depoſited by the ſea, and raiſed up by volcanoes, or ſwept away by a violent irruption, a powerful inundation, or an univerſal deluge. This hypotheſis concerning the formation of mountains is borrowed from nature itſelf, and appears to be confirmed by many facts in natural hiſtory.

We ſhall now proceed to ſtate the height of moſt of the primitive mountains; an object no leſs worthy of attention than their ſtructure and variety.

According to M. Pontoppidan, the higheſt mountains in Norway are 3000 toiſes in height. According to M. Brovallius, the higheſt mountains in Sweden are 2333 toiſes. It is ſuppoſed, however, that both theſe calculations are erroneous.

From the Memoirs of the Academy of Sciences at Paris, it appears, that the mountains in France moſt elevated above the ſurface of the Mediteranean are the Puy-de-Dome, which is 817 toiſes, and the Mont d'Or, which is 1048 toiſes. Theſe two mountains are in Auvergne, and are ſuppoſed to be extinguiſhed volcanoes. Mount Cantal is 993 toiſes high: Mount Ventoux is 1036: the ſouth peak of Canigou in the Pyrenees, according to M. de Rocheblave, is 1442; and according to M. de Plantade, 1453: and Saint Barthelemi is 1184.

M. Needham obſerves, that the higheſt Alps in Savoy are the convent of the great Saint Bernard, at the point of the rock to the ſouth-weſt of that mountain, which is 1274 toiſes; Mount Sérené, which is 1283; and Mount Tourne, which is 1683. According to the meaſurement of the Engliſh obſerver, the peak or needle of Argentiere is 2094 toiſes high. M. Facio de Duiller and M. Duluc make the ridge of Mont Blanc 2213 toiſes; but according to the obſervation of M. Shuckburg, its elevation is 2447 toiſes one foot (by M. de Sauſſure's meaſurement 2426 toiſes) above the level of the Mediteranean.

The principal mountains of the Alps are among the moſt elevated in the world; and particularly Mont-Blanc, that enormous maſs of granite, which is ſituated in the centre of the Alps, and the acceſs to which is rendered ſo difficult by the ſharp peaks, walls of ice, and everlaſting ſnows wherewith it is covered, is the higheſt mountain which has been meaſured either in Europe, Aſia, or Africa. The altitude of the Alps of Switzerland has been aſcertained by different philoſophers; We ſhall content ourſelves with mentioning the moſt remarkable of thoſe mountains covered with ſnow, which in Switzerland are called *Gletſchers* or *Glaciers*. St Gothard, according to Scheuchzer, is 1650 toiſes; and Lignon, near the lake of Como, north eaſt, is, according to Pini, 1486 toiſes in height. M. Paſumot, engineer to the king of the French, juſtly obſerves, that the heights aſſigned by Mikheli to the mountains of Switzerland appear rather to be ideal computaions than founded on obſervations. An opinion of them may be formed from the following: According to this author, Mount Pilate or Frankmont, in the diſtrict of Lucerne, is 1403 toiſes in height; Mount Cenis, 1445; Raukhſtok, 1760; the Nolle ridge of Titliſberg, 2001, Ghemi, 2421; Grimſelberg, in the canton of Berne, 2539; the Cornera, part of Loukmanier, 2654: Fourke, 2669; Schrekhorn, 2724; and St Gothard, at its moſt elevated point, 2750. Mikheli likewiſe reckons 20 other mountains, the height of which exceeds 2000 toiſes. The reader may conſult the *Table comparative des hauteurs des principales montagnes*, by M. Paſumot (*Journal de Phyſique*, September 1783.)

Throughout the globe we will not perhaps meet with higher mountains than thoſe of Peru, which go by the name of *Cordilleros de los Andos*. According to the obſervations of the academicians ſent to South America in 1735 by the Spaniſh aund French courts to meaſure a degree of the meridian and to aſcertain the true figure of the earth, the principal ſummits of theſe extraordinary mountains, which are ſituated near Quito, and which are conſtantly covered with ſnow though they lie under the equator, have the following geometrical elevations above the level of the ſea; Quito-Capilate, 1707 toiſes; El-Coraſon, 2470 (c); Cota-catche, 2570; Ek-Atlas, 2730; and Noyamble-orcu, under the line, 3030. All the other mountains have been or ſtill are, volcanoes. The following is an enumeration of them, together with their ſeveral heights: Pichincha 2430; Cargavi-raſo, 2450; Sinchonalagon or Sinchoulagoa, 2570; Sangai, 2680; Illinika 2717, Kotopaxi, 2950; Antiſana, 3020; Cagambeorcon, ſituated under the line, 3030; Cimboraſo or Chimboraco, 3220. The laſt mentioned mountain, which forms part of the Cordilleras in Peru, is one of the largeſt and probably the higheſt in the world. It is ſeen at ſea from the gulph of Guayaquil, which is more than 60 leagues diſtant.

Other very elevated mountains are Mount Sinai in Japan; Mount Caucaſus in Aſia; the ſouthern peak of the Pyrenees; the peak of Teneriffe in one of the Canary iſlands, which according to M. Bouguer is 2100 toiſes (according to later obſervations, made by M. M. de Verdun, de Borda, and Pingre, French academicians, in 1754, the peak of Teyde, more commonly known by the name of the ***peak of Teneriffe***, is only 1904 toiſes perpendicular height above the level of the ſea) Mount Gibel or Etna in Sicily is 1672 toiſes; St George's peak in the Azores; Adam's peak in Ceylon; the mountains of the Moon; Mounts Athos, Olympus, Taurus, and Emaus: Mount Cenis in the Alps on the road from France to Italy, is 1460 toiſes; the Great and Little Atlas, and many others, on the top of which we feel, even in the middle of ſummer, a more piercing cold than that of the ſevereſt froſts of our climates. After this, it cannnot appear wonderful that the vapours which reach ſo great heights are there congealed; and that the ſummits of theſe mountains, even in the warmeſt climates, are conſtantly covered with ſnow, while the inhabitants of the plain enjoy a temperate atmoſphere, or are ſubject to extreme heat. The height of thoſe mountains, added to their being placed on the moſt elevated parts of the globe, is the chief cauſe of the phenomena peculiar to them. In that part of Aſia which is ſeparated by the chain of mountains called the ***Ghauts***, there are two very different ſeaſons at one and the ſame time. While it is winter on the Malabar coaſt, for inſtance, the Coromandel coaſt, which has the ſame degree of elevation, and in ſome places is only 20 leagues diſtant, enjoys an agreeable ſpring or the temperature of autumn. The traveller in the Alps generally experiences, even in ſummer, the four ſeaſons of the year. In the Andes we meet with a change of temperature no leſs curious; for as we deſcend from their ſummit to their baſe, we experience all the varieties of heat and cold which are felt in every climate of the earth, at whatever ſeaſon (D). There are many other mountainous countries in which we paſs at once from a ſerene ſky to dreadful

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(c) This is the greateſt height to which any perſon is known to have aſcended in America; the greateſt elevation which has been reached in the Alps is the top of Mont-Blanc, which is 2426 toiſes, and which Dr Paccard aſcended on the 8th of Auguſt 1786. M. de Sauſſure arrived there likewiſe on the 3d of Auguſt 1787, accompanied by 17 perſons.

(D) The more we are elevated above the ſurface of the earth, it becomes the colder; and accordingly the tops of the higheſt mountains are always covered with ſnow. At the height of about 2300 toiſes above the level of the ſea, no plant whatever is found to grow: and it appears from the obſervations of MM. de la Condamine, Bouguer, Godin, Dom George Juan, and Dom Antonio de Ulloa, the academicians ſent to Quito in 1735, that at the height of 2434 the ſnow is perpetual, and never melts at any time of the year even under the equator. The congelation begins and continues in all the mountains of the Cordilleras at the ſame height above the level of the ſea, which is determined by an equal elevation of the mercury in the barometer. But from experiments which have been made, Sir Iſaac Newton concludes, that the denſity of the atmoſphere at any height is as the weight of the incumbent air, that is, as the height of the mercury in the barometer; and conſequently the denſity of the air is the ſame in the whole region of the atmoſphere, where the congelation is continual, and where that perpetual cold commences which is felt on all mountains. Above this conſtant height the denſity of the air continues to diminiſh, and the cold becomes greater and greater till we dreadful ſtorms and tempeſts. It cannot therefore be doubted, that mountains have a great influence on the temperature of the countries to which they belong, by ſtopping the courſe of certain winds, by forming barriers to the clouds, by reflecting the ſun's rays, and by ſerving as elevated conductors to the electricity of the atmoſphere. It was formerly ſaid by travellers, that on the peak of Teneriffe they found that brandy loſt its ſtrength; that ſpirit of wine became almoſt inſipid; that pepper, ginger, and ſalt, had little or no taſte when applied to the tongue; but, it was alleged, that Canary wines ſtill retained their ſtate on that mountain. Theſe ſtories appeared too marvellous not to require new experiments; and M M. de Lamanon and Mongez, who viſited this peak in 1785, tell us, that the flavour and taſte of liquors appeared to have ſuſtained no loſs at that height: (See the experiments made on the Pic du Midi in the Pyrenees by M. Darcet, in the *Journal de Phyſique* for November 1776; and a journey to the peak of Teneriffe, in the ſame *Journal* for Auguſt 1785.) At the foot, and ſometimes at the middle, of thoſe lofty mountains, the tops of which are always covered with ſnow, we frequently find ſprings which begin to run in May and dry up in September. When the ſun approaches near enough to the tropic to warm the ſummits of theſe mountains, the ſnow with which they are covered melts, filtrates through their interior part, and iſſues forth at their baſe. The only trees which grow on mountains of this kind are firs, pines, and other reſinous trees; and the graſs becomes ſhorter towards their ſummit.

Mountains were not formed to be an uſeleſs load upon the earth, but evidently anſwer very important purpoſes; and we cannot enough admire their form and that kind of harmony which is diſcernible in their arrangement. Some of them, vomiting out fire or ſmoke, lava, and ſulphur, indicate that they in ſome meaſure anſwer the purpoſe of a chimney to ſomething within the earth, which, if confined, would burſt it in pieces: (See VOLCANO.) Of this kind are Mount Hecla in Iceland, Mount Etna in Sicily, Mount Veſuvius in the kingdom of Naples, Pichincha and Kotopaxi in America, &c. Others, the ſummits of which reach into the clouds, attract and abſorb the vapours of the ſea, &c. which float in the air. It is obſerved by M. l'Abbé Palaſſon, that ſtorms are moſt frequent at the foot of thoſe high mountains which form extenſive chains. Their enormous maſſes, which ſeem to ſupport the heavens on their ſhoulders, arreſt and fix the different meteors as they are formed. The clouds, in like manner, driven by the winds from different points of the horizon, there meet with impenetrable barriers, are there accumulated in great quantity, and remain ſuſpended on theſe bulwarks of the globe's ſurface, till the agitation of the atmoſphere ſucceeding the calm, produces ſtorms, which are ſo much the more terrible that they cannot expand and be diſperſed but with great difficulty. They are commonly repelled from the mountains; and are then obſerved to ſpread over whole countries, to diſſolve with peals of thunder, and to fall down in deſtructive hail-ſhowers fatal to the harveſt and to the whole produce of the fields. This ſcourge is peculiarly dreadful during the ſeaſons of ſpring and ſummer, when a ſufficient quantity of ſnow remains on the mountains to cool the atmoſphere.

Some chains of mountains have openings; in others they are wanting: of the former kind are the ſtraits of Thermopylæ, the Caſpian ſtraits, the paſs of the Cordilleras, &c.

Thoſe ſpaces which ſeparate the tops of mountains are ſo many baſons deſtined for the reception of the condenſed miſts, and of the clouds precipitated into rain. The bowels of mountains appear to be great and inexhauſtible reſervoirs, and to contain ſubterraneous canals and lateral openings formed by the hand of nature, that the ſeveral ſpecies of animals may be ſupplied with drink, that the earth may be fertiliſed, and that nouriſhment may be afforded for the growth of vegetables. The ſtreams and rivers deſcend from the ridges of mountains, the declivities of which form ſo many inclined plains: Thus we find the Alps give riſe to the Rhine, the Danube, the Rhone, and the Po. With regard to the wonderful ſtructure, by means of which ſo many advantages are obtained, ſee the articles EARTH, SPRINGS, &c.

Mountains of the firſt order form vaſt ſolitudes and horrid deſerts, where the habitations of men are not to be ſeen, and their footſteps are ſeldom to be traced. By their grandeur, their elevation, the variety of their poſitions, the ſublime and awful exhibition of wonders which they contain, they elevate the mind and fire the imagination of the obſerver. But theſe majeſtic eminences have other advantages which deſerve our attention. They form the common retreat of a multitude of wild beaſts, which are ſubſervient to our uſe: there the bear, the lynx, the ermine, the martin, the fox, and many other animals, the ſkins of which we employ for furs, take up their abode; and thither the eagle and the vulture reſort in ſafety. Mountains likewiſe afford nouriſhment to rein-deer, buffaloes, fallow-deer, roe-deer, and chamois; and they are viſited by birds of paſſage which, under the guidance of inſtinct, follow the ſhorteſt road to the place of their deſtination. They produce medicinal plants, which almoſt never grow elſewhere. In Swiſſerland they are alſo covered with deep foreſts, which, by the great height of the trees, announce their antiquity. They afford both timber and fuel, and ſupply the inhabitants with abundance of excellent paſture for their beſtial during the whole ſummer. The moſt precious ſtones, both for brilliancy and hardneſs, acquire their forms and colours in the fiſſures of the rocks: the internal rents of mountains are filled and in a manner cemented by different metallic ſubſtances; while the grottos are furniſhed with numerous congelations, ſhining

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we reach the ſummits of the mountains, which preſent to our view all the horrors of winter as they are felt in the polar regions. But below this height, as the denſity of the air becomes greater in conſequence of being conſtantly preſſed upon by a great ſuperincumbent weight, the ſun's heat increaſes, ſo that thoſe who inhabit the plains at the foot of the mountain are expoſed to all the inconveniences of the torrid zone.

ſhining cryſtals, and ſubſtances of an extraordinary nature and figure. In ſhort, every thing concurs to ſhow, that the exiſtence of mountains is abſolutely neceſſary; and that in order to acquire a proper knowledge of them, they muſt be conſidered in many different points of view. Their poſition, their direction, their elevation, the extent of their baſe, their figure, their various external windings, their internal ſtructure; in a word, every thing relating to the theory of the globe, and to the different temperatures of the atmoſphere, muſt engage the obſerver's attention; and by ſtudying and carefully examining the general conſtitution of mountains, the particular facts which they preſent to our view, their influence, their action on the atmoſphere, the different ſubſtances of which they are compoſed, together with the arrangement and mixture of theſe ſubſtances, we may at length diſcover the true mechaniſm of the earth. The reader may conſult the *Eſſais Sur l'etude des Montagnes; Journal de M. l' Abbé Rozier*, November 1773.

The difficulty and danger of aſcending to the tops of mountains proceeds not from the thinneſs of the air, as has been commonly reported; but the reaſon is, that they riſe with ſuch a rugged and precipitate aſcent, that they are utterly inacceſſible. In ſome places they appear like a great wall of 600 or 700 feet high; in others, there ſtick out enormous rocks, that hang upon the brow of the ſteep, and every moment threaten deſtruction to the traveller below.

In this manner almoſt all the tops of the higheſt mountains are bare and pointed: and this naturally proceeds from their being ſo continually aſſaulted by thunders and tempeſts. All the earthy ſubſtances with which they might have been once covered, have for ages been waſhed away from their ſummits; and nothing is left remaining but immenſe rocks, which no tempeſt has hitherto been able to deſtroy.

Nevertheleſs, time is every day and every hour making depredations; and huge fragments are ſeen tumbling down the precipice, either looſened from the ſummit by the froſt or rains, or ſtruck down by lightning. Nothing can exhibit a more terrible picture than one of theſe enormous rocks, commonly larger than an houſe, falling from its height, with a noiſe louder than thunder, and rolling down the ſide of the mountain. Dr Plot tells us of one in particular, which being looſened from its bed, tumbled down the precipice, and was partly ſhattered into a thouſand pieces. Notwithſtanding, one of the largeſt fragments of the ſame, ſtill preſerving its motion, travelled over the plain below, croſſed a rivulet in the midſt, and at laſt ſtopped on the other ſide of the bank! Theſe fragments, as was ſaid, are often ſtruck off by lightning and ſometimes undermined by rains; but the moſt uſual manner in which they are diſunited from the mountain is by froſt: the rains inſinuating between the interſtices of the mountain, continue there until there comes a froſt; and then, when converted into ice, the water ſwells with an irreſiſtible force, and produces the ſame effect as gun-powder, ſplitting the moſt ſolid rocks, and thus ſhattering the ſummits of the mountain.

But not rocks alone, but whole mountains, are, by various cauſes, diſunited from each other. We ſee, in many parts of the Alps, amazing clefts, the ſides of which ſo exactly correſpond with the oppoſite, that no doubt can be entertained of their having been once joined together. At Cajeta in Italy, a mountain was ſplit in this manner by an earthquake; and there is a paſſage opened through it, that appears as if elaborately done by the induſtry of man. In the Andes theſe breaches are frequently ſeen. That at Thermopylæ in Greece has been long famous. The mountain of the Troglodytes in Arabia has thus a paſſage through it; and that in Savoy, which nature began and which Victor Amadeus completed, is an inſtance of the ſame kind.

We have accounts of ſome of theſe diſruptions immediately after their happening. "In the month of June, in the year 1714, a part of the mountain of Diableret, in the diſtrict of Valais in France, ſuddenly fell down, between two and three o'clock in the afternoon, the weather being very calm and ſerene. It was of a conical figure, and deſtroyed 55 cottages in the fall. Fifteen perſons, together with about 100 beaſts, were alſo cruſhed beneath its ruins, which covered an extent of a good league ſquare. The duſt it occaſioned inſtantly covered all the neighbourhood in darkneſs. The heaps of rubbiſh were more than 300 feet high. They ſtopped the current of a river that ran along the plain, which now is formed into ſeveral new and deep lakes. There appeared, through the whole of this rubbiſh, none of thoſe ſubſtances that ſeemed to indicate that this diſruption had been made by means of ſubterraneous fires. Moſt probably, the baſe of this rocky mountain was rotted and decayed; and thus fell, without any extraneous violence." In the ſame manner, in the year 1618, the town of Pleurs in France was buried beneath a rocky mountain, at the foot of which it was ſituated.

Theſe accidents, and many more that might be enumerated of the ſame kind, have been produced by various cauſes: by earthquakes, as in the mountain at Cajeta; or by being decayed at the bottom, as at Diableret. But the moſt general way is, by the foundation of one part of the mountain being hollowed by waters, and, thus wanting a ſupport, breaking from the other. Thus it generally has been found in the great chaſms in the Alps, and thus it almoſt always is known in thoſe diſruptions of hills which are known by the name of *land ſlips*. Theſe are nothing more than the ſliding down of an higher piece of ground, diſrooted from its ſituation by ſubterraneous inundations, and ſettling itſelf upon the plain below.

There is not an appearance in all nature that ſo much aſtoniſhed our anceſtors as theſe land-ſlips. In fact, to behold a large upland, with its houſes, its corn, and cattle, at once looſened from its place, and floating as it were upon the ſubjacent water; to behold it quitting its ancient ſituation, and travelling forward like a ſhip, in queſt of new adventures; this is certainly one of the moſt extraordinary appearances that can be imagined; and, to a people ignorant of the powers of nature, might well be conſidered as a prodigy. Accordingly, we find all our old hiſtorians mentioning it as an omen of approaching calamities. In this more enlightened age, however, its cauſe is very well known; and, inſtead of exciting ominous apprehenſions in the populace, it only gives riſe to ſome very ridiculous law-ſuits among them, about whoſe the property ſhall be; whether the land which has thus ſlipt, ſhall belong to the original poſſeſſor or to him upon whoſe grounds it has encroached and ſettled. What has been the determination of the judges is not ſo well known; but the circumſtances of the ſlips themſelves have been minutely enough and exactly deſcribed.

In the lands of Slatberg in the kingdom of Ireland, there ſtood a declivity gradually aſcending for near half a mile. In the year 1713, and on the 10th of March, the inhabitants perceived a crack on its ſide, ſomewhat like a furrow made with a plough, which they imputed to the effects of lightning, as there had been thunder the night before. However, on the evening of the ſame day, they were ſurpriſed to hear an hideous confuſed noiſe iſſuing all round from the ſide of the hill; and their curioſity being raiſed, they reſorted to the place. There, to their amazement, they found the earth, for near five acres all in gentle motion, and ſliding down the hill upon the ſubjacent plain. This motion continued the remaining part of the day and the whole night: nor did the noiſe ceaſe during the whole time; proceeding probably from the attrition of the ground beneath. The day following, however, this ſtrange journey down the hill ceaſed entirely; and above an acre of the meadow below was found covered with what before compoſed a part of the declivity.

However, theſe ſlips, when a whole mountain's ſide ſeems to deſcend, happen but very rarely. There are ſome of another kind, however, much more common; and, as they are always ſudden, much more dangerous. Theſe are ſnow-ſlips, well known, and greatly dreaded by travellers. It often happens, that when ſnow has long been accumulated on the tops and on the ſides of mountains, it is borne down the precipice either by means of tempeſt or its own melting. At firſt, when looſened, the volume in motion is but ſmall; but it gathers as it continues to roll; and by the time it has reached the habitable parts of the mountain, it is generally grown of enormous bulk. Wherever it rolls, it levels all things in its way, or buries them in unavoidable deſtruction. Inſtead of rolling, it ſometimes is found to ſlide along from the top; yet even thus it is generally as fatal as before. Nevertheleſs, we have had an inſtance a few years ago, of a ſmall family in Germany that lived for above a fortnight beneath one of theſe ſnow-ſlips. Although they were buried during that whole time in utter darkneſs, and under a bed of ſome hundred feet deep, yet they were luckily taken out alive, the weight of the ſnow being ſupported by a beam that kept up the roof, and nouriſhment ſupplied them by the milk of a ſhe-goat that was buried under the ſame ruin.

Attraction of MOUNTAINS. This is a late diſcovery, and a very conſiderable confirmation of Sir Iſaac Newton's theory of univerſal gravity. According to the Newtonian ſyſtem, an attractive power is not only exerted between thoſe large maſſes of matter which conſtitute the ſun and planets, but likewiſe between all comparatively ſmaller bodies, and even between the ſmalleſt particles of which they are compoſed. Agreeably to this hypotheſis, a heavy body, which ought to gravitate or tend toward the centre of the earth, in a direction perpendicular to its ſurface, ſuppoſing the ſaid ſurface to be perfectly even and ſpherical, ought likewiſe, though in a leſs degree, to be attracted and tend towards a mountain placed on the earth's ſurface; ſo that a plumb-line, for inſtance, of a quadrant hanging in the neighbourhood of ſuch a mountain, ought to be drawn from a perpendicular ſituation, in conſequence of the attractive power of the quantity of matter of which it is compoſed acting in a direction different from that exerted by the whole maſs of matter in the earth, and with a proportionably inferior degree of force.

Though Sir Iſaac Newton had long ago hinted at an experiment of this kind, and had remarked, that "a mountain of an hemiſpherical figure, three miles high and ſix broad, would not, by its attraction, draw the plumb-line two minutes out of the perpendicular (E): yet no attempt to aſcertain this matter by actual experiment was made till about the year 1738; when the French academicians, particularly Meſſrs Bouger and Condamine, who were ſent to Peru to meaſure a degree under the equator, attempted to diſcover the attractive power of Chimboraço, a mountain in the province of Quito. According to their obſervations, which were however made under circumſtances by no means favourable to an accurate ſolution of ſo nice and difficult a problem, the mountain Chimboraço, exerted an attraction equal to eight ſeconds. Though this experiment was not perhaps ſufficient to prove ſatisfactorily even the reality of an attraction, much leſs the preciſe quantity of it; yet it does not appear that any ſteps had been ſince taken to repeat it.

Through the munificence of his Britannic majeſty, the royal ſociety were enabled to undertake the execution of this delicate and important experiment: the aſtronomer-royal was choſen to conduct it. After various inquiries, the mountain Schehallien, ſituated nearly in the centre of Scotland, was pitched upon as the moſt proper for the purpoſe that could be found in Britain. The obſervations were made by taking the meridian zenith diſtances of different fixed ſtars, near the zenith, by means of a zenith ſector of ten feet radius; firſt on the ſouth, and afterwards on the north ſide of the hill, the greateſt length of which extended in an eaſt and weſt direction.

It is evident, that if the maſs of matter in the hill exerted any ſenſible attraction, it would cauſe the plumb-line of the ſector, through which an obſerver viewed a ſtar in the meridian, to deviate from its perpendicular ſituation, and would attract it contrarywiſe at the two ſtations, thereby doubling the effect. On the ſouth ſide the plummet would be drawn to the northward, by the attractive power of the hill placed to the northward of it: and on the north ſide a contrary and equal deflection of the plumb-line would take

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(E) By a very eaſy calculation it is found that ſuch a mountain would attract the plumb-line 1′ 18″ from the perpendicular.

the place, in conſequence of the attraction of the hill, now to the ſouthward of it. The apparent zenith diſtances of the ſtars would be affected contrarywiſe; thoſe being increaſed at the one ſtation which were diminiſhed at the other: and the correſpondent quantities of the deflection of the plumb-line would give the obſerver the ſum of the contrary attractions of the hill, acting on the plummit at the two ſtations; the half of which will of courſe indicate the attractive power of the hill.

The various operations requiſite for this experiment laſted about four months; and from them it appears, that the ſum of the two contrary attractions of the mountain Schehallien, in the two temporary obſervations which were ſucceſſively fixed half-way up the hill (where the effect of its attraction would be greateſt), was equal to 11″. 6.—From a rough computation, founded on the known law of gravitation, and on an aſſumption that the denſity of the hill is equal to the mean denſity of the earth, it appears that the attraction of the hill ſhould amount to about the double of this quantity. From thence it was inferred, that the denſity of the hill is only about half the mean denſity of the earth. It does not appear, however, that the mountain Schehallien has ever been a volcano, or is hollow; as it is extremely ſolid and denſe, and ſeemingly compoſed of an entire rock.

The inference drawn from theſe experiments may be reduced to the following:

"1. It appears, that the mountain Schehallien exerts a ſenſible attraction; therefore, from the rules of philoſophiſing, we are to conclude, that every mountain, and indeed every particle of the earth, is endued with the ſame property, in proportion to its quantity of matter.

"2. The law of the variation of this force, in the inverſe ratio of the ſquares of the diſtances, as laid down by Sir Iſaac Newton, is alſo confirmed by this experiment. For if the force of attraction of the hill had been only to that of the earth as the matter in the hill to that of the earth, and had not been greatly increaſed by the near approach to its centre, the attraction thereof muſt have been wholly inſenſible. But now, by only ſuppoſing the mean denſity of the earth to be double to that of the hill, which ſeems very probable from other conſiderations, the attraction of the hill will be reconciled to the general law of the variation of attraction in the inverſe duplicate ratio of the diſtances, as deduced by Sir Iſaac Newton from the compariſon of the motion of the heavenly bodies with the force of gravity at the ſurface of the earth; and the analogy of nature will be preſerved.

"3. We may now, therefore, be allowed to admit this law, and to acknowledge, that the mean denſity of the earth is at leaſt double of that at the ſurface; and conſequently that the denſity of the internal parts of the earth is much greater than near the ſurface. Hence alſo, the whole quantity of matter in the earth will be at leaſt as great again as if it had been all compoſed of matter of the ſame denſity with that at the ſurface; or will be about four or five times as great as if it were all compoſed of water.—This concluſion, Mr Maſkelyne adds, is totally contrary to the hypotheſis of ſome naturaliſts, who 'ſuppoſe the earth to be only a great hollow ſhell of matter; ſupporting itſelf from the property of an arch, with an immenſe vacuity in the midſt of it.' But, were that the caſe, the attraction of mountains, and even ſmaller inequalities in the earth's ſurface, would be very great, contrary to experiment, and would affect the meaſures of the degrees of the meridian much more than we find they do; and the variation of gravity, in different latitudes, in going from the equator to the poles, as found by pendulums, would not be near ſo regular as it has been found by experiment to be.

"4. As mountains are by theſe experiments found capable of producing ſenſible deflections of the plumb-lines of aſtronomical inſtruments; it becomes a matter of great importance, in the menſuration of degrees in the meridian, either to chooſe places where the irregular attractions of the elevated parts may be ſmall; or where, by their ſituation, they may compenſate or counteract the effects of each other."

For meaſuring the heights of mountains, ſee the article Barometer.

Burning Mountains. See Ætna, Hecla, Veſuvius, and Volcano.

Marble Mountains. Of theſe there are great numbers in Egypt, from which, though immenſe quantities have been carried off for the multitude of great works erected by the ancient Egygtians; yet, in the opinion of Mr Bruce who paſſed by them in his journey to Abyſſinia, there is ſtill ſuch an abundant ſupply, that it would be ſufficient to build Rome, Athens, Corinth, Syracuſe, Memphis, Alexandria, and half a dozen more of ſuch cities.

The firſt mountain of this kind mentioned by Mr Bruce is one oppoſite to Terſowey, conſiſting partly of green marble, partly of granite, with a red bluſh upon a grey ground, and ſquare oblong ſpots. Here he ſaw a monſtrous obeliſk of marble, very nearly ſquare, broken at the end, and nearly 30 feet long and 19 feet in the face. Throughout the plain there were ſcattered ſmall pieces of jaſper, with green, white, and red ſpots, called in Italy *diaſpro ſanguine;* and all the mountains upon that ſide ſeemed to conſiſt of the ſame materials. Here alſo were quantities of ſmall pieces of granite of various kinds, as well as porphyry, which had been carried down by a torrent, probably from the ancient quarries. Theſe pieces were white mixed with black ſpots, and red with green veins and black ſpots. All the other mountains on the right hand were of red marble, but no great beauty; thoſe on the oppoſite ſide being green marble, probably of the ſerpentine kind. This, he ſays, was one of the moſt extraordinary ſights he ever ſaw. The former mountains were of a conſiderable height, without a tree, ſhrub, or blade of graſs upon them; and this looked exactly as if it had been covered over with Havannah and Brazil ſnuff. Proceeding farther on, he entered another defile with mountains of green marble on every ſide. The higheſt he ſaw appeared to be compoſed of ſerpentine marble; having a large vein of green jaſper ſpotted with red running through about one-third of its thickneſs. It was extremely hard; ſo that it did not yield to the blows of a hammer, though it was evident that it had formerly been quarried; and there were channels for bringing water, which terminated in this quarry of jaſper; "a proof (ſays Mr Bruce) that water was one of the means uſed in cutting thoſe hard ſtones,"

On theſe mountains, our author obſerves, that "the porphyry ſhows itſelf by a fine purple ſand without any gloſs upon it, though the colour is very agreeable to the eye. It is mixed with the white ſand and fixed marble of the plains. Green and unvariegated marble is alſo found in the ſame mountain with the porphyry. The marble is brittle for ſome inches where the two veins meet: but the porphyry is as hard as in other places. The granite appears like a dirty brown ſtone covered with ſand; but this is only the change made upon it by the ſun and weather; for on breaking it, the colour appears to be green with black ſpots, and a reddiſh caſt on the ſurface. The reddiſh colour appears to be impaired by expoſure to the atmoſphere; but is recovered upon poliſhing it anew. It is in greater quantity than the porphyry, and nearer to the Red Sea. The granite is next to the prophyry, but never joined with it in the ſame mountain. Being covered with a reddiſh ſand, it looks as if the whole mountain were covered with brick duſt." There is likewiſe a kind of red marble with white veins, which our author has ſeen at Rome and likewiſe in Britain. The common green, called *ſerpentine*, looks as if it were covered with Brazil ſnuff. Along with this green he ſaw two ſamples of the beautiful kind called *Iſabella*; one of them with the yellowiſh caſt of Quaker-colour, the other of that bluiſh caſt called *dove colour*; and theſe two ſeemed to divide the mountains with the ſerpentine. Here alſo he ſaw the vein of jaſper; but had not time to determine whether it was the ſame with that called bloody-jaſper or blood-ſtone or not.

The marble of greateſt value, however, is that called *Verde Antico*, which is of a dark-green colour with white ſpots. It is found, like the jaſper, in the mountains of the plain green ſerpentine, and is not diſcoverable by the duſt or any particular colour upon it. "Firſt (ſays Mr Bruce) there is a blue flaky ſtone exceedingly even and ſmooth in the grain, ſolid, and without ſparks and colour. When broken it is ſomething lighter than a ſlate, and more beautiful than moſt kinds of marble; it is like the lava of volcanoes when poliſhed. After lifting this we come to the beds of verde antico; and here the quarrying is very obvious; for it has been uncovered in patches not above 20 feet ſquare. Then, in another part the green ſtone has been removed and another pit wrought." In other places of the plain he ſaw pieces of African marble, but no rocks or mountains, of it. He ſuppoſes it to be found in the heart of ſome other coloured marble, and in ſtrata like the jaſper and verde antico; and, as he ſuſpects, in the mountains of Iſabella marble, eſpecially of the yelloweſt ſort. This vaſt ſtore of marble is placed on a ridge, whence there is a deſcent to the eaſt and weſt, ſo that it could be conveyed either to the Nile or the Red Sea. The level ground and hard fixed gravel are proper for the heavieſt carriages; ſo that any weight whatever might eaſily be conveyed to the place of embarkation. In the more diſtant mountains alſo he obſerved the ſame care taken to facilitate the carriage: for the defiles between thoſe mountains he ſuppoſes not to be natural but artificial openings: and he obſerved the road, from them to the Nile to be cut with a deſcent of about one foot in 50 at moſt, ſo that, all the way down, the carriages muſt have moved with as little draught as poſſible, at the ſame time that the vaſt friction would prevent any undue acceleration; to which alſo ſome other means muſt have contributed: But thus, he thinks, it may be explained how ſuch immenſe blocks might have been removed as were employed in the ancient Egyptian works.

Mountains of marble and porphyry are not peculiar to Egypt, for they are likewiſe to be met with in the north of Scotland; and in the Weſtern Iſles there are likewiſe ſuch quantities of theſe materials to be met with, as, in the opinion of Mr Williams, would be ſufficient to ſerve all Europe.

Written Mountain, *Mountain of Inſcriptions*, or *Jibbel-al-Mokatteb*, a ſuppoſed mountain, or chain of mountains, in the wilderneſs of Sinai; on which, for a great extent of ſpace, the marble of which the mountain conſiſts is inſcribed with innumerable characters reaching from the ground ſometimes to the height of 12 or 14 feet. Theſe were mentioned by a Greek author in the third century, and ſome of them have been copied by Pococke and other late travellers; notwithſtanding which, there is ſtill a very great uncertainty even of the *exiſtence* of ſuch mountain or mountains. The vaſt number of theſe inſcriptions, the deſart place in which they are found, and the length of time requiſite for executing the taſk, has induced a notion by no means unnatural, that they are the work of the Iſraelites during their forty years wandering in the wilderneſs. Others are of opinion that they contain nothing of any importance, but conſiſt merely of the names of travellers and the dates of their journeys

M. Niebuhr, who viſited this country about 30 years ago, made every attempt in his power, though without ſucceſs, to obtain a ſight of this celebrated mountain. On applying to ſome Greeks at Suez, they all declared that they knew nothing of the written mountain: they, however, directed him to an Arabian ſheik, who had paſſed all his lifetime in travelling between Suez and Mount Sinai; but he knew no more of it than the former. Underſtanding, however, that a conſiderable reward would be given to any perſon who would conduct them thither, this Arab directed them to another; who pretended not only to know that mountain, but all others upon which there were any inſcriptions throughout the deſart. On inquiring particularly, however, our travellers found that he was not to be depended upon; ſo that they were obliged to have recourſe to a fourth ſheik, who by his converſation convinced them that he had ſeen mountains with inſcriptions in unknown characters upon them. It does not appear, however that this perſon was very capable, more than the reſt, of leading them to the place they ſo much wiſhed for; though he conducted them to ſome rocks upon which there were inſcriptions in unknown characters. They are moſt numerous in a narrow paſs between two mountains named *Om-er-ridſtein*; and, ſays M. Niebuhr, "the pretended Jibel-al-Mokatteb may poſſibly be in its neighbourhood." Some of theſe inſcriptions were copied by our author; but he does not look upon them to be of any conſequence. “ They ſeem (ſays he) to have been executed at idle hours by travellers, who were ſatisfied with cutting the unpoliſhed rock with any pointed inſtrument, adding to their names and the date of their journeys ſome rude figures, which beſpeak the hand of a people but little ſkilled in the arts. When ſuch inſcriptions are executed with the deſign of tranſmitting to poſterity the memory of ſuch events as might afford inſtructive leſſons, greater care is generally taken in the preparation of the ſtones, and the inſcriptions are engraven with more regularity.”

When M. Niebuhr arrived at laſt at the mountain to which the ſheik had promiſed to conduct him, he did not find there any inſcriptions; but on climbing up to the top, he found nothing there but an Egyptian cemetery, the ſtones of which were covered with hieroglyphics. The tomb ſtones are from five to ſeven feet in length, ſome ſtanding on end and others lying flat; and “ the more carefully they are examined (ſays he), the more certainly do they appear to be ſepulchral ſtones, having epitaphs inſcribed on them. In the middle of theſe ſtones is a building, of which only the walls now remain; and within it are likewiſe a great many of the ſepulchral ſtones. At one end of the building ſeems to have been a ſmall chamber, of which the roof ſtill remains. It is ſupported upon ſquare pillars; and theſe, as well as the walls of the chamber, are covered with hieroglyphic inſcriptions. Thro' the whole building are various buſts executed in the manner of the ancient Egyptians. The ſepulchral ſtones and the buſts are of hard and fine-grained ſand-ſtone.” M. Niebuhr is of opinion that this cemetery was not the work of the Egyptians themſelves, but of ſome colony which came from Egypt, and had adopted the manners and cuſtoms of the people. He ſuppoſes that it might have been built by the Arabs who had conquered Egypt under the ſhepherd kings and adopted the Egyptian manners during their reſidence there. As it muſt have belonged to an opulent city, however, he owns that there is a great difficulty in accounting for the exiſtence of ſuch a city in the midſt of a deſart.

The tranſlator of Volney's travels aſcribes theſe inſcriptions to the pilgrims which viſit Mount Sinai. But to this, as well as to every other conjecture, there is this objection, that whether the inſcriptions be well executed or not, whether they contain matters of importance or not, they ought to have been written in a language which *ſomebody* could underſtand; but from the copies that have been taken of them by Dr Pococke, and others, it does not appear that they could be explained either by him or any other perſon.

When Dr Clayton, biſhop of Clogher, viſited this part of the world about the year 1723, he expreſſed the greateſt deſire to have the matter concerning this written mountain or mountains aſcertained, and even made an offer of L. 500 Sterling to any literary perſon, who would undertake the journey and endeavour to decypher the inſcriptions; but no ſuch perſon has appeared, and the exiſtence of the mountains is teſtified only by the ſuperior of a convent at Cairo, who gave that mentioned in the beginning of this article. Untill that part of the world, therefore, become more acceſſible to travellers, there is but little hope that we can come to any certainty in the matter. M. Niebuhr plainly, from his own accounts, had not influence enough with the Arabs to ſhow him almoſt any thing, as they refuſed to conduct him even to the ſummit of Mount Sinai.

White MOUNTAINS. See *New* HAMPSHIRE.

MOUNTAINS *of the Moon*, a chain of mountains in Africa, extending themſelves between Abyſſinia and Monomotapa, and receiving the above denomination from their great height.

MOUNTAINS *of the Lions*, alſo in Africa, divide Nigritia from Guinea, and extend as far as Ethiopia. They were ſtyled by the ancients *the mountains of God*, on account of their being greatly ſubject to thunder and lightning.

MOUNTAIN *of Forty-days*; a mountain of Judea, ſituated in the plain of Jericho to the north of that city. According to the Abbe Mariti's deſcription, the ſummit of it is covered neither with ſhrubs, turf, nor earth: it conſiſts of a ſolid maſs of white marble, the ſurface of which is become yellow by the injuries of the air. “ The path by which you aſcend to it (ſays our author) fills one with terror, as it riſes with a winding courſe between two abyſſes, which the eye dares ſcarcely behold. This path is at firſt pretty broad, but it at length becomes ſo confined, that one can with difficulty place both feet upon it at the ſame time. When we had aſcended a little higher, we found an Arab ſtretched out on the path, who made us pay a certain toll for our paſſage. Here the traveller requires courage. One of the parapets of the path being broke, we clung to the part which remained until we had reached a ſmall grotto, ſituated very commodiouſly as it gave us an opportnnity of recovering our breath. When we had reſted ourſelves a little, we purſued our courſe, which became ſtill more dangerous. Suſpended almoſt from the rock, and having before our eyes all the horror of the precipice, we could advance only by dragging one foot after the other; ſo that had the ſmalleſt fragment given way under us, we ſhould have been hurried to the bottom of this frightful abyſs.

“ Proceeding a little farther, we found a ſecond grotto, the entrance of which was about nine feet in breadth. It would be of conſiderable ſize were not about two-thirds of it filled up by part of the roof, which had tumbled down. This grotto conducts to another, which we had the curioſity to enter, but we were almoſt ſtifled by the great number of bats which were fluttering up and down in it. Being deſirous of retreating almoſt as ſoon as we had entered they flew in ſuch numbers around us that they in a manner covered our whole bodies; but they luckily made a paſſage for themſelves, and ſuffered us to breathe with freedom. By the glimmering light which reached this grotto, we perceived that the bottom of it was covered to the height of a hand-breadth with the excrements of theſe animals; and we remarked ſome niches in the ſides of it, which gave us reaſon to conclude, that it had once ſerved as a ſepulchre to the ancient anchorets. This is the more probable, as the other grotto appears by the remains of an altar and of ſome Greek paintings to have been formerly a church. In the right corner there is a large ciſtern, the plaſter of which retains its original ſolidity, though

Mountain, Mourning.

broken in a few places. In the left corner there is a ſmall ſtair which conducts to a third grotto. This is much longer and broader than any of the former, and its wall are ornamented alſo with Greek paintings, which repreſent the twelve apoſtles in their natural ſize. Their figures, however, are ſo much changed, that one could ſcarcely diſtinguiſh who they are, were it not that their names are written in Greek characters upon the glory which ſurrounds their heads.—At the farther end of this grotto ſtands a ſquare altar a little damaged; above which is an oval painting of the Annunciation, in perfect preſervation. The chiſel has been employed to render theſe grottos regular and ſmooth; and it appears that they were inhabited by a certain number of hermits, who devoted themſelves to a life of contemplation. No writer has been able to tell us who the founder of this hermitage was.—Nicephorus and Euſebius who have deſcribed all the churches and religious places of Paleſtine and Judea; do not ſpeak of theſe chapels.

"This mountain is one of the higheſt in the province, and one of its moſt ſacred places. It takes its name from the rigorous faſt which Chriſt obſerved here after having triumphed over the vanities of the world and the power of hell. In remembrance of this miracle, a chapel was formerly conſtructed on the ſummit of the mountain. It may be ſeen from the plain, but we could not approach it, as the path was almoſt entirely deſtroyed. It, however, may be acceſſible on the other ſide of the mountain, which we did not viſit. A great many ſcattered grottos are ſeen here; in one of which, according to Quareſmius, were depoſited the bodies of ſeveral anchorets, which are ſtill entire. I have heard the ſame thing aſſerted in the country, but I could never meet with any perſon who had ſeen them. Here we enjoyed the moſt beautiful proſpect imaginable. This part of the Mountain of Forty Days overlooks the mountain of Arabia, the country of Gilead, the country of the Ammonites, the plains of Moab, the plain of Jericho, the river Jordan, and the whole extent of the Red Sea. It was here that the devil ſaid to the ſon of God, " All theſe kingdoms will I give thee, if thou wilt fall down and worſhip me."

MOURNING, a particular dreſs or habit worn to ſignify grief on ſome melancholy occaſion, particularly the death of friends or of great public characters.—The modes of mourning are various in various countries; as alſo are the colours that obtain for that end. In Europe, the ordinary colour for mourning is black; in China, it is white; in Turkey, blue or violet; in Egypt, yellow; in Ethiopia, brown. White obtained formerly in Caſtile on the death of their princes. Herrera obſerves, that the laſt time it was uſed was in 1498, at the death of prince John. Each people pretend to have their reaſons for the particular colour of their mourning: white is ſuppoſed to denote purity; yellow, that death is the end of human hopes. in regard that leaves when they fall, and flowers when they fade, become yellow; brown denotes the earth, whither the dead return; black, the privation of life, as being the privation of light: blue expreſſes the happineſs which it is hoped the deceaſed does enjoy: and purple or violet, ſorrow on the one ſide, and hope on the other, as being a mixture of black and blue.

Mourning.

Mourning, among the ancients, was expreſſed various ways.

Amongſt the Jews, on the death of their relations or intimate friends, grief or mourning was ſignified by weeping, tearing their clothes, ſmiting, their breaſts, or tearing them with their nails, pulling or cutting off their hair and beards, walking ſoftly, *i, e.* bare foot, lying upon the ground, faſting, or eating upon the ground. They kept themſelves cloſe ſhut up in their houſes, covered their faces, and abſtained from all work, even reading the law, and ſaying their uſual prayers. They neither dreſſed themſelves nor made their beds, nor ſhaved themſelves, nor cut their nails, nor went into the bath, nor ſaluted any body: ſo that ſulkineſs ſeems to have been an indication of ſorrow: and dirtineſs, of diſtreſs. The time of mourning among the Jews was generally ſeven days: tho' this was lengthened or ſhortened according to circumſtances; but 30 days were thought ſufficient upon the ſevereſt occaſions. The different periods of the time of mourning required different degrees of grief, and different tokens of it.

The Greeks, on then death of friends, ſhowed their ſorrow by ſecluding themſelves from all gaiety, entertainments, games, public ſolemnities, the enjoyment of wine, and the delights of muſic. They ſat in gloomy and ſolitary places, ſtripped themſelves of all external ornaments, put on a courſe black ſtuff by way of mourning, tore their hair, ſhaved their heads, rolled themſelves in the duſt and mire, ſprinkled aſhes on their heads, ſmote their breaſts with their palms, tore their faces, and frequently cried out with a lamentable voice and drawling tone, reiterating the interjection ε, ε, ε, ε; hence funeral lamentations were called Ελεγοι. If they appeared in public during the time of mourning, they had a veil thrown over their faces and heads. During the funeral proceſſion, certain perſons called εξαρχοι θρηνων marched before, and ſung melancholy ſtrains called ολοφυρμοι ιαλεμοι, Λινοι and Αιλινοι. Theſe vocal mourners ſung thrice during the proceſſion round the pile and round the grave. Flutes were alſo uſed to heighten the ſolemnity. At the funerals of ſoldiers, their fellow-ſoldiers who attended, as a teſtimony of their affliction, held their ſhields, their ſpears, and the reſt of their armour, inverted.

As to the tokens of private grief among the Romans, they were the ſame as thoſe already obſerved as cuſtomary amongſt the Greeks. Black or dark-brown were the colour of the mourning habits worn by the men; they were alſo common to the women. The mourning of the emperors at firſt was black. In the time of Auguſtus, the women wore white veils, and the reſt of their dreſs black. From the time of Domitian they wore nothing but white habits, without any ornaments of gold, jewels, or pearls. The men let their hair and beards grow, and wore no wreaths of flowers on their heads while the days of mourning continued. The longeſt time of mourning was ten months; this was Numa's eſtabliſhment, and took in his whole year. For a widow to marry during this time was infamous. Mourning was not uſed for children who died under three years of age. From this age to ten they mourned as many months as the child was years old. A remarkable victory or other happy event, occaſioned the ſhortening of the time of mourning: The birth of a child, or the attainment of any remarkable honour in the family, certain feaſts in honour of the gods, or the conſecration of a temple, had the ſame effect. After the battle of Cannæ, the commonwealth decreed that mourning ſhould not be worn for more than 30 days, that the loſs might be forgot as ſoon as poſſible. When public magiſtrates died, or perſons of great note, alſo when any remarkable calamity happened, all public meetings were intermitted the ſchools of exerciſe, baths, ſhops, temples, and all places of concourſe, were ſhut up, and the whole city put on a face of ſorrow: the ſenators laid aſide the *laticlave*, and the conſuls ſat in a lower ſeat than ordinary. This was the cuſtom of Athens alſo, and was obſerved upon the death of Socrates not long after he had been ſentenced to death by their judges.

Preficæ, or mourning women, (by the Greeks called θρηνου εξαρχοι), went about the ſtreets: this was cuſtomary among the Jews as well as the Greeks and Romans, (Jerem. ix. 17.)

MOUSE, in zoology. See Mus.

Mouse-Ear, in botany. See Hieracium.

Mouse Tail. See Myoxus.

Dor-Mouse. See Myohua.

Shrew-Mouse. See Sorex.

MOUSELLE, the name of an Eaſt Indian tree, with white tubular flowers, which fall off every day in great plenty. They are of a ſweet agreeable ſmell and the Gentoos are very fond of wearing them, ſtringing and hanging them about their necks and arms. The fruit is a pale red-cherry, of the ſhape and ſize of our white heart-cherry, but the foot-ſtalk is not quite ſo long. This fruit has a ſtone in it containing a bitter oily kernel. The Indians rub with this oil any part ſtung by a ſcorpion or bitten by a centipede, which it ſoon cures. The crows are very fond of the fruit.

MOUSEL, or Mosul, a large city of Turkey in Aſia, and capital of a Beglerbegate, ſtands on the weſt banks of the Tigris, in the latitude, according to Mr Ives's obſervation, of 36° 30. It is ſurrounded with ſtone-walls, but has many of its ſtreets lying waſte. Tavernier ſpeaks of it as a ruined place, with only two bad markets and a ſorry caſtle; yet, he ſays, that it is much frequented by merchants, and that its baſha commands 3000 men. There is a bridge of boats over the Tigris; and the city is a thoroughfare from Perſia to Syria, which makes it a place of trade, and which is more augmented by a conſtant traffic from this place to Bagdad. The country on this ſide the river is ſandy and barren: but over againſt it is exceedingly fruitful, and yields very good crops of corn and fruit in abundance. Mr Ives ſays it was the beſt built city he had ſeen in Turkey; but had nothing in it to attract the notice of an European. It was beſieged for near ſix months by Nadir Shah without ſucceſs. Breaches were frequently made in the walls, and aſſaults continued for three days ſucceſſively; but the aſſailants were conſtantly repulſed, and the breaches made in the day-time repaired during the night. The beſieged had unanimouſly reſolved to die rather than to ſubmit. The Turks declared, that ſhould the place be forced to ſurrender, they were determined to put to death all their wives and daughters firſt, that they might not fall into the vile hands of the abhorred Perſians. The place was therefore defended with uncommon bravery; even the women and children exerted themſelves with the greateſt alacrity. The Chriſtians behaved in ſuch a manner as to gain the eſteem and admiration of the other inhabitants; and ſome of their churches being demoliſhed, they were afterwards repaired at the expence of government.

In this city there are a great many moſques, the largeſt and moſt ſtately of which is ornamented on the top with green tiles. At the doors of theſe houſes there are uſually inſcriptions in gilt letters, declaring the awfulneſs of the building, as being the houſe of God. One of them has a minaret which bends like thoſe of Bagdad. Some of the moſt bigotted Turks ſay, that Mahomet ſaluted this minaret as he paſſed; on which it bent its head in reverence to the prophet, and ever after continued in that ſituation. The manufacture of this city is *muſſolin* (muſlin), which is made very ſtrong and pretty fine. In the year 1757 this city and the country adjacent was viſited by a dreadful famine, owing to the preceding hard winter, and innumerable multitudes of locuſts, by which the fruits of the earth were deſtroyed. When Mr Ives was there in 1758, the country was comparatively depopulated. Almoſt all the brute creation had been deſtroyed for the ſubſiſtence of man. During the famine the people had eaten dogs, and every kind of animal which is held in abhorrence at any other time, not ſparing even their own children; and the dead bodies lay in the ſtreets for want of people to bury them. Their fruit-trees were alſo deſtroyed by the froſt; ſo that when our author was there ſcarce any fruit could be had. The neighbouring mountains afford ſilver mines; and they would yield much quickſilver if the Turks had either the ſkill or inclination to work them to advantage. Lanza ſays, that ſome time ago an Engliſhman who travelled through theſe parts got two or three bottles of it, which he preſented to the baſha as a ſpecimen of what might be done in that way: but no farther attempt was made. Here alſo are ſome lead mines, which ſupply as much of that metal as furniſhes them with bullets and ſome neceſſary utenſils.

MOU-TAN, or peony-shrub of China: alſo called *hoa-ouang*, or "the king of flowers;" and *pe-leang-kin*, "an hundred ounces of gold," in alluſion to the exceſſive price given formerly by ſome of the virtuoſi for certain ſpecies of this plant. The mou tan ſeems to claim pre-eminence, not only on account of the ſplendor and number of its flowers, and of the ſweet odour which they diffuſe around, but alſo on account of the multitude of leaves which compoſe them, and of the beautiful golden ſpots with which they are interſperſed. This plant, which is of a ſhrubby nature, ſhoots forth a number of branches, which form a top almoſt as large as thoſe of the fineſt orange-trees that are planted in boxes. Some of the mou-tan have been ſeen eight or ten feet in height. The reaſon why few are raiſed at preſent to this ſize is, becauſe their flowers are leſs beautiful, and their branches being too weak, cannot ſuſtain their weight. The root of the mou-tan is long and fibrous, of a pale yellow colour, and covered with a greyiſh or reddiſh rind. Its leaves are deeply indented, and of a much darker green above than below. Its flowers, which are compoſed of numberleſs

berleſs petals, blow like a roſe, and are ſupported by a calyx compoſed of four leaves. From the bottoms of the petals ariſe ſeveral ſtamina without any order which bear on their tops ſmall antheræ, of a beautiful golden colour. The fruit bend downwards like thoſe of common peony, burſt when they become dry, and ſhed their ſeeds.

Groſier's Hiſt. of China.

There are three kinds of mou-tan common mou-tan, dwarf mou-tan, and the mou-tan tree. The laſt ſpecies ſeems at preſent to be loſt; ſome of them were formerly ſeen which were 25 feet in height. Dwarf mou-tan is little eſteemed: a few plants of this kind are only cultivated to preſerve the ſpecies. Common mou-tan, which has always been highly prized by floriſts, is more generally diſperſed. It is raiſed like an eſpalier in form of a fan, buſh, or orange-tree. Some of them flower in ſpring, others in ſummer, and ſome in autumn. Theſe different ſpecies muſt each be cultivated in a different manner.

The vernal and ſummer mou-tan are thoſe that are cultivated in greateſt number; thoſe of autumn require too ſlaviſh an attention during the great heat of the dog-days. The mou-tan of each ſeaſon are divided into ſingle and double; the former are ſubdivided into thoſe of 100 leaves and 1000 leaves; the ſecond have a large calyx filled with ſtamina, that bear on their tops gold coloured antheræ. Theſe are the only kind that produce ſeed. The flowers of both appear under the different forms of a baſon, pomegranate, marigold, &c. Some of the mou-tan are red, others violet, purple, yellow, white, black, and blue; and theſe colours, varied by as many ſhades, produce a prodigious number of different kinds. We are aſſured, that the Chineſe floriſts have the ſecret of changing the colour of their mou-tan, and of giving them whatever tints they pleaſe; but they cannot effect this change but upon thoſe plants which have never produced flowers.

A mou-tan, to pleaſe the eye of a Chineſe floriſt, muſt have a rough crooked ſtalk, full of knots, and of a blackiſh green colour; its branches muſt croſs one another, and be twiſted in a thouſand fantaſtical figures; the ſhoots that proceed from them muſt be of a delicate green ſhaded with red; the leaves muſt be large, of a beautiful green, very thick, and ſupported by reddiſh ſtalks; its flowers muſt blow at different times, in form of a tuft, be all of the ſame colour, and ſtand erect upon their ſtems; they muſt alſo be ſeven or eight inches in diameter, and exale a ſweet and agreeable odour.

MOUTH, in anatomy, a part of the face, conſiſting of the lips, the gums, the inſides of the cheeks, the palate, the ſalival glands, the os hyoides, the uvula, and the tonſils, which ſee under the article ANATOMY.

Mr Derham obſerves, that the mouth in the ſeveral ſpecies of animals is nicely adapted to the uſes of ſuch a part, and well ſized and ſhaped for the formation of ſpeech, the gathering and receiving of food, the catching of prey, &c. In ſome creatures it is wide and large, in others little and narrow; in ſome it is formed with a deep inciſure into the head, for the better catching and holding of prey, and more eaſy commution of hard, large, and troubleſome food; and in others with a ſhorter inciſure, for the gathering and holding of herbaceous food. In birds it is neatly ſhaped for piercing the air: hard and horny, to ſupply the want of teeth; hooked, in the rapacious kind, to catch and hold their prey; long and ſlender in thoſe that have their food to grope for in mooriſh places; and broad and long in thoſe that ſearch for it in the mud. Nor is the mouth leſs remarkable in inſects; in ſome it is forcipated, to catch, hold, and tear the prey; in others aculeated, to pierce and wound animals, and ſuck their blood; in others, ſtrongly rigid, with jaws and teeth, to gnaw and ſcrape out their food, carry burdens, perforate the earth, nay the hardeſt wood, and even ſtones themſelves, for houſes and neſts for their young.

MOUVANS (Paul Richard), ſurnamed the *Brave*, a Proteſtant officer, was born at Caſtellan in Provence, of a reſpectable family, and made a conſiderable figure in the civil wars of France during the 16th century. His brother, who was likewiſe a Proteſtant, having been killed in a popular tumult excited by the Romiſh prieſts at Draguignan, he took up arms to avenge his death; and, having aſſembled 2000 men, committed great devaſtations in Provence. Being purſued by the Count de Tende at the head of 6000 men, and finding himſelf too weak to keep the field, he took poſt in a convent ſtrongly fortified by nature, and there reſolved to defend himſelf to the laſt extremity. That the war might be terminated amicably, the Count de Tende propoſed an interview; to which Mouvans agreed, on condition that his brother's murderers ſhould be puniſhed, and that thoſe who had taken up arms with him ſhould not be moleſted. Theſe terms being accepted, he diſmiſſed his troops, reſerving only a guard of 50 men for the ſecurity of his perſon. This precaution was not unneceſſary; for the parliament of Aix had received orders from court to puniſh him capitally for being concerned in the conſpiracy of Amboiſe. The baron de la Garde made an attempt to apprehend him, but he was worſted and repulſed with conſiderable loſs. Mouvans at length reſolved to retire to Geneva, where his life would not be in danger; and there he lived for ſome time in tranquillity, nobly rejecting the ſplendid offers made him by the duke of Guiſe if he would join the Catholic party. He returned to France at the recommencement of the troubles, in conſequence of the maſſacre of Vaſſy in 1562, and continued to diſtinguiſh himſelf in the Proteſtant armies. His conduct at Siſteron, where he commanded together with Captain Senas when that city was beſieged by the Count de Sommerive, is particularly deſerving of admiration. After ſuſtaining an aſſault of ſeven hours, in which the beſiegers were repulſed with conſiderable loſs, Mouvans, perceiving that he was too weak to wait a ſecond, determined to abandon the city, and left it during the night with his troops and thoſe of the inhabitants who choſe to accompany him, by a paſs which the enemy had neglected to guard. The number of the inhabitants amounted to 4000 of every age and ſex, men, women, children, and mothers with their infants at their breaſt. This body, in which there was not 1000 men fit to bear arms, directed their courſe towards Grenoble. Muſketeers were placed in the front and rear, while the defenceleſs and unarmed occupied the centre. To add to the difficulty of the march, they were frequently obliged to go out of the way, and to croſs ſteep and

Mowee || Moyle.

rugged mountains, in order to avoid the ambuſcades which the enemy had laid for them on the road. They ſtopped ſome days to refreſh themſelves in the valleys of Angrone and Pragelas, where they were cordially received and ſupplied with proviſions by the Vaudois. After a march of 21 or 22 days, and being expoſed to the greateſt fatigue and famine, the wretched fugitives at length arrived at Grenoble. The baron des Adrets ſent them under an eſcort to Lyons, where they remained till the treaty of pacification. In 1568 Mouvans was defeated at Meſignac in Perigord, and loſt his life in the engagement. Upon this occaſion he commanded, together with Peter Gourde, the advanced guard of the Proteſtant army. It is alleged, that in deſpair he daſhed out his brains againſt a tree.

MOWEE, one of the Sandwich iſlands diſcovered by Captain Cook, is 162 miles in circumference. A low iſthmus divides it into two circular peninſulas, of which the eaſtern is double the ſize of the weſtern. The mountains in both riſe to an exceeding great height, and may be ſeen at the diſtance of more than 30 leagues. The northern ſhores, like thoſe of Owyhee, afford no ſoundings, and the country preſents the ſame appearance of verdure and fertility. Near the weſt point of the ſmaller peninſula is a ſpacious bay, with a ſandy beach ſhaded with cocoa-nut trees. The country behind has a moſt romantic appearance, the hills riſing almoſt perpendicularly in a great variety of peaked forms; and their ſteep ſides and deep chaſms between them are covered with trees. The tops of theſe hills are entirely bare, and of a reddiſh brown colour. The number of inhabitants are computed at about 65,000. E. Long. 204. 4. N. Lat. 20. 50.

MOXA, or MUGWORT of China; is a ſoft lanuginous ſubſtance, prepared in Japan from the young leaves of a ſpecies of ARTEMISIA, by beating them together when thoroughly dried, and rubbing them betwixt the hands till only the fine fibres are left. The down on the leaves of mullein, cotton, hemp, &c. do as well as moxa.

In the Eaſtern countries it is uſed by burning it on the ſkin; a little cone of the moxa is laid upon the part, previouſly moiſtened, and ſet on fire at the top; it burns down with a temperate glowing heat, and produces a dark coloured ſpot, the exulceration of which is promoted by applying a little garlic; the ulcer is left to diſcharge, or is ſoon healed according to the intention in uſing the moxa. See ARTEMISIA.

MOYLE (Walter), a learned Engliſh writer in the 18th century, deſcended of a good family in Cornwall, where he was born in 1672. He was ſent to Oxford, and thence removed to the temple; where he applied himſelf chiefly to the general and more noble parts of the law, ſuch as led him to the knowledge of the conſtitution of the Engliſh government. In 1697 he had a ſhare with Mr Trenchard in writing a pamphlet, intitled, "An Argument ſhowing that a Standing Army is inconſiſtent with a Free Goverment, and abſolutely deſtructive to the Conſtitution of the Engliſh Monarchy." He tranſlated Xenophon's Diſcourſe upon Improving the State of Athens. He was for ſome time member of parliament, in which he always acted an honourable part; applying himſelf to the improvement and regulation of trade, and the employment of the poor, which has ſo near a connection with trade. He afterwards retired to his ſeat at Bake in Cornwall, where he applied himſelf with vigour to his ſtudies, and died in 1721. In 1726, his works were printed at London, in 2 vols 8vo.

Moyle || Mucus.

MOYRA. See MOIRA.

MUCILAGE, in pharmacy, is in general any viſcid or glutinous liquor.

MUCILAGE, alſo imports the liquor which principally ſerves to moiſten the ligaments and cartilages of the articulations, and is ſupplied by the mucilaginous glands.

MUCOR, in botany: A genus of the order of fungi, belonging to the cryptogamia claſs of plants. The fungus has veſicular heads ſupported by foot-ſtalks.—There are 12 ſpecies; the moſt remarkable of which are, 1. The ſphærocephalus, or grey round-headed mucor, growing upon rotten wood, and ſometimes upon decayed plants and moſſes. The ſtalks of this are generally black, about a line in height; bearing each at the top a ſpherical ball about the ſize of a pin's head; its coat or rind is covered with a grey powder, and containing within a black or fuſcous ſpongy down. The coat burſts with a ragged, irregular margin. 2. The lichenoides, or little, black, pin-headed mucor. This ſpecies grows in groups near to each other, in chaſms of the barks of old trees, and upon old park-pales. The ſtalks are black, about two lines in height; bearing each a ſingle head, ſometimes a double or treble one, of the ſize of muſtard or poppy ſeeds, of a roundiſh figure at firſt, but when burſt often flattiſh or truncated, and of a black colour. The internal powdered down is black with a tinge of green. 3. The mucedo, or common grey mould, grows on bread, fruits, plants, and other ſubſtances in a putrid ſtate. It grows in cluſters: the ſtalks a quarter of an inch high, pellucid, hollow, and cylindrical; ſupporting each a ſingle globular head, at firſt tranſparent, afterwards dark grey; which burſts with elaſtic force, and ejects ſmall round ſeeds diſcoverable by the microſcope. 4. The glaucus, or grey cluſter-headed mould, is found on rotten apples, melons, and other fruits: as alſo upon decayed wood, and the ſtalks of wheat. Theſe are of a pellucid grey colour; the ſtalks generally ſingle, ſupporting a ſpherical ball, which, when magnified, appears to be compounded of numerous, fine, moniliform, necklace-like radii. 5. The cruſtaceus, or fingered mould, is frequent upon corrupted food of various kinds. It is of a white aqueous colour; the ſtalks ſingle, each ſupporting at the top four or five necklace-like radii, diverging from the ſame point or centre. 6. The ſepticus, or yellow frothy mucor, is found on the leaves of plants, ſuch as ivy and beech, &c. ſometimes upon dry ſticks, and frequently upon the tan or bark in hot-houſes. It is of no certain ſize or figure, but of a fine yellow colour, and a ſubſtance reſembling at firſt cream beat up into froth. In the ſpace of 24 hours it acquires a thin filmy coat, becomes dry and full of a ſooty powder, adhering to downy threads. The ſeeds under the microſcope appear to be globular. Haller ranks it under a new genus, which he terms *fuligo*; the characters of which are, that the plants contained under it are ſoft, and like butter at firſt, but ſoon change into a black ſooty powder.

MUCUS, a mucilaginous liquor ſecreted by certain glands,

Mucus,
Muck.

glands, and ſerving to lubricate many of the internal cavities of the body. In its natural ſtate it is generally limpid and colourleſs; but, from certain cauſes, will often aſſume a thick conſiſtence and whitiſh colour like pus. As it is ſometimes of very great importance in medicine to diſtinguiſh theſe two fluids from each other, this was lately propoſed as the ſubject of a prize diſputation by the Æſculapian Society of Edinburgh. The prize was gained by Mr Charles Darwin ſtudent of medicine from Litchfield. The concluſions drawn from his experiments were,

1. Pus and mucus are both ſoluble in the vitriolic acid, though in very different proportions, pus being by far leaſt ſoluble.

2. The addition of water to either of theſe compounds decompoſes it. The mucus thus ſeparated either ſwims in the mixture or forms large flocculi in it; whereas the pus falls to the bottom, and forms, on agitation, an uniform turbid mixture.

3. Pus is diffuſible through a diluted vitriolic acid, though mucus is not. The ſame alſo occurs with water, or with a ſolution of ſea-ſalt.

4. Nitrous acid diſſolves both pus and mucus. Water added to the ſolution of pus produces a precipitate, and the fluid above becomes clear and green, while water and the ſolution of mucus form a turbid dirty-coloured fluid.

5. Alkaline lixivium diſſolves, though ſometimes with difficulty, mucus, and generally pus.

6. Water precipitates pus from ſuch a mixture, but does not mucus.

7. Where alkaline lixivium does not diſſolve pus, it ſtill diſtinguiſhes it from mucus, as it then prevents its diffuſion through water.

8. Coagulable lymph is neither ſoluble in concentrated nor diluted vitriolic acid.

9. Water produces no change on a ſolution of ſerum in alkaline lixivium, until after long ſtanding, and then only a very ſlight ſediment appears.

10. Corroſive ſublimate coagulates mucus, but does not pus.

From the above experiments it appears, that ſtrong vitriolic acid and water, diluted vitriolic acid, and cauſtic alkaline lixivium and water, will ſerve to diſtinguiſh pus from mucus; that the vitriolic acid can ſeparate it from coagulable lymph, and alkaline lixivium from ſerum.

Hence, when a perſon has any expectorated matter, the decompoſition of which he wiſhes to aſcertain, let him diſſolve it in vitriolic acid, and in cauſtic alkaline lixivium; and let him add pure water to both ſolutions. If there be a fair precipitation in each, he may be aſſured that ſome pus is preſent. But if there be a precipitation in neither, it is a certain teſt that the mixture is entirely mucus. If the matter cannot be made to diſſolve in alkaline lixivium by time and trituration, we have alſo reaſon to believe that it is pus.

MUCK, or RUNNING A MUCK, is a practice that has prevailed time immemorial in Batavia. To run a muck, in the original ſenſe of the word, is to get intoxicated with opium, and then ruſh into the ſtreet with a drawn weapon, and kill any one that comes in the way, till the party is himſelf either killed or taken priſoner. If the officer takes one of theſe *amocks* or *mohawks* (as they have been called by an eaſy corruption) alive, he has a conſiderable reward; and the unhappy wretches are always broken alive on the wheel: but ſuch is the fury of their deſperation, that three out of four are neceſſarily deſtroyed in attempting to ſecure them.

Mud
Mugil.

MUD IGUANA. See MURÆNA.

MUFFEL, in chemiſtry, a veſſel much uſed in ſome metallurgic operations. In figure it repreſents an oblong arch or vault, the hinder part of which is cloſed by a ſemicircular plane, and the lower part or floor of which is a rectangular plane. It is a little oven that is placed horizontally in aſſay and enamelling furnaces, ſo that its open ſide correſponds with the door of the fire-place of the furnace. Under this arched oven ſmall cupels or crucibles are placed; and the ſubſtances contained are thus expoſed to heat without contact of fuel, ſmoke, or aſhes.

MUFTI, the chief of the eccleſiaſtical order, or primate of the muſſulman religion. The authority of the mufti is very great in the Ottoman empire; for even the ſultan himſelf, if he would preſerve any appearance of religion, cannot, without hearing his opinion, put any perſon to death, or ſo much as inflict any corporal puniſhment. In all actions, eſpecially criminal ones, his opinion is required, by giving him a writing in which the caſe is ſtated under feigned names; which he ſubſcribes with the words, *He ſhall*, or *Shall not be, puniſhed.* Such outward honour is paid to the mufti, that the grand ſignior himſelf riſes up to him, and advances ſeven ſteps to meet him when he comes into his preſence. He alone has the honour of kiſſing the ſultan's left ſhoulder, whilſt the prime vizer kiſſes only the hem of his garment. When the grand ſignior addreſſes any writing to the mufti, he gives him the following titles: *To the eſad, the wiſeſt of the wiſe, inſtructed in all knowledge, the moſt excellent of excellents, abſtaining from things unlawful, the ſpring of virtue and of true ſcience, heir of the prophetic doctrines, reſolver of the problems of faith, revealer of the orthodox articles, key of the treaſures of truth, the light to the doubtful allegories, ſtrengthened with the grace of the ſupreme legiſlator of mankind, may the Moſt High God perpetuate thy virtues!* The election of the mufti is ſolely in the grand ſignior, who preſents him with a veſt of rich ſables, &c. If he is convicted of treaſon, or any great crime, he is put into a mortar kept for that purpoſe in the Seven Towers at Conſtantinople, and pounded to death.

MUGGLETONIANS, a religious ſect which aroſe in England about the year 1657; ſo denominated from their leader Ludowick Muggleton, a journeyman taylor, who, with his aſſociate Reeves, ſet up for great prophets, pretending, as it is ſaid, to have an abſolute power of ſaving and damning whom they pleaſed; and giving out that they were the two laſt witneſſes of God that ſhould appear before the end of the world.

MUGIL, the MULLET; in ichthyology, a genus of fiſhes belonging to the order of abdominales. The lips are membranaceous, the inferior one being carinated inwards; they have no teeth; the branchioſtege membrane has ſeven crooked rays; the opercula are ſmooth and round; and the body is of a whitiſh colour. There are two ſpecies, diſtinguiſhed by the number of rays in the back-fin.

The mullet is juſtly ranked by Ariſtotle among the *piſces littorales*, or thoſe that prefer the ſhores to the full ſea; they are found in great plenty on ſeveral of the ſandy coaſts of Britain, and haunt in particular thoſe ſmall bays that have influxes of freſh water. They come in great ſhoals, and keep rooting like hogs in the ſand or mud, leaving their traces in form of large round holes. They are very cunning; and when ſurrounded with a net, the whole ſhoal frequently eſcapes by leaping over it; for when one takes the lead, the others are ſure to follow. This circumſtance is obſerved by Oppian; who alſo informs us, that if theſe fiſhes fail to get over at the firſt leap, they never attempt a ſecond, but lie without motion as if they reſigned themſelves to their fate. Mr Pennant ſays he is uncertain whether this laſt obſervation holds good or not: however, Oppian had good opportunity of examining thoſe fiſh, as they ſometimes ſwarm on the coaſts of the Mediterranean. Near Martegues, in the ſouth of France, abundance of mullets are taken in weres made of reeds placed in the ſhallows. Of the milts of the males, which are there called *alletants*, and of the roes of females, which are called *botar*, is made botargo. The materials are taken out entire, covered with ſalt for four or five hours, then preſſed a little between two boards or ſtones, waſhed, and at laſt dried in the ſun for 13 or 14 days.

This fiſh was ſometimes made the inſtrument of a horrible puniſhment for unfortunate gallants. It was uſed both at Athens and Rome; but it is very doubtful whether it was a legal puniſhment or not. By Horace it is mentioned in the following lines:

> Diſcincta tunica fugiendum eſt, ac pede nudo;
> Ne nummi pereant, aut Pyga, aut denique fama.
> SAT. II. lib. i. 132.

The mullet is an excellent fiſh for the table, but at preſent not a faſhionable one. The albula * is caught in great quantities about the Bahama iſlands at the times they go in ſhoals to ſpawn; and is there eſteemed very good eating.

* Plate CCCXV.

MUGWORT, in botany: a ſpecies of ARTEMISIA. An infuſion of this plant in white wine, or a bath made of it, has been always eſteemed an emmenagogue, and uſeful in difficult parturition. The leaves, when young and tender, are frequently made uſe of by the Highlanders of Scotland as a pot herb. The country-people in Sweden drink a decoction of them for the ague.

MUID, a large meaſure in uſe among the French, for things dry. The muid is no real veſſel uſed as a meaſure, but an eſtimation of ſeveral other meaſures; as the ſeptier, mine, minot, buſhel, &c.

MUID, is alſo one of the nine caſks, or regular veſſels uſed in France, to put wine and other liquors in. The muid of wine is divided into two demi-muids, four quarter muids, and eight half quarter muids containing 36 ſeptiers.

MULATTO, a name given to thoſe who are begotten by a negro man on a white woman, or by an white man on a negro woman.

MULBERRY, in botany. See MORUS.

MULBERRY-Cyder, a name given by the people of Devonſhire, and ſome other parts of England, to a ſort of Cyder rendered very palatable by an admixture of mulberry juice in the making: they chooſe for the purpoſe the ripeſt and blackeſt mulberries, and preſſing out their juice and mixing it with a full-bodied cyder at the time of the grinding and preſſing, give juſt ſo much of it as adds a perceptible flavour. It is very worthy the attention of people who live in other countries, where ſtrong and good cyder is made, that this renders it a ſort of wine much more agreeable than any other Engliſh liquor, and might be brought into general uſe, to the great advantage of the dealer. The colour of this liquor reſembles that of the brighteſt red wine, and the flavour of the mulberry never goes off. Phil. Tranſ. Nº 133.

MULCT, a fine of money laid upon a man who has committed ſome fault or miſdemeanour.

MULE, in zoology, a mongrel kind of quadruped, uſually generated between an aſs and a mare, and ſometimes between a horſe and a ſhe-aſs; but the ſignification of the word is commonly extended to every kind of animal produced by a mixture of two different ſpecies. There are two kinds of theſe animals; one from the he-aſs and mare, the other from the horſe and the ſhe-aſs. We call them indifferently *mules*, but the Romans diſtinguiſhed them by proper appellations. The firſt kind are the beſt and moſt eſteemed: as being larger, ſtronger, and having leaſt of the aſs in their diſpoſition. The largeſt and ſtouteſt aſſes, and the faireſt and fineſt mares, are choſen in thoſe countries where theſe creatures are moſt in uſe; as in Spain, Italy, and Flanders. In the laſt eſpecially, they ſucceeded in having very ſtately mules from the ſize of their mares, ſome of them 16 and ſome 17 hands high, which are very ſerviceable as ſumpter-mules in the army. But ſince the Low countries are no longer under the dominion of Spain, they breed fewer mules. Theſe creatures are very much commended for their being ſtronger, ſurer footed, going eaſier, being more cheaply maintained, and laſting longer than horſes. They are commonly of a black-brown, or quite black, with that ſhining liſt along the back and croſs the ſhoulders which diſtinguiſhes aſſes. In former times they were much more common in Britain than at preſent; being often brought over in the days of Popery by the Italian prelates. They continued longeſt in the ſervice of millers; and are yet in uſe among them in ſome places, on account of the great loads they carry on their back. As they are capable of being trained for riding, bearing burdens, and for draught, there is no doubt that they might be uſefully employed in many different ſervices. But they are commonly found to be vicious, ſtubborn, and obſtinate to a proverb; which whether it occaſions or is produced by the ill uſage they meet with, is a point not eaſily ſettled. Whatever may be the caſe of aſſes, it is allowed that mules are larger, fairer, and more ſerviceable in mild than in warm climates. In the British American colonies, both on the continent and in the iſlands, but eſpecially in the latter, they are much uſed and eſteemed; ſo that they are frequently ſent to them from England, ſuffer leſs in the paſſage, and die much ſeldomer than horſes, and commonly yield, when they arrive, no inconſiderable profit.

It has commonly been aſſerted, that animals produced by the mixture of two heterogeneous ſpecies are incapable of generating, and thus perpetuating the monſtrous breed; but this, we are informed by M. Buffon, is now diſcovered to be a miſtake. Ariſtotle, ſays he, tells us, that the mule engenders with the mare, and that the junction produces an animal which the Greeks call *hinnus*, or *ginnus*. He likewiſe remarks, that the ſhe mule eaſily conceives, but ſeldom brings the fœtus to perfection. But the moſt remarkable and well atteſted inſtance of this fact, is mentioned in a letter read by M. d'Alembert before the academy of ſciences, which informed him that a ſhe-mule in the iſland of St Domingo had brought forth a foal. The fact was atteſted by perſons of the moſt unqueſtionable veracity; and other inſtances, though not ſo well authenticated, are adduced by our author. We may therefore, continues M. Buffon, conſider it as an eſtabliſhed fact, that the he mule can generate and the ſhe mule produce. Like other animals, they have a ſeminal liquor, and all the organs neceſſary to generation. But mongrel animals are always leſs fertile and more tardy than thoſe of a pure ſpecies. Beſides, mules have never produced in cold climates, ſeldom in warm regions, and ſtill more ſeldom in temperate countries. Hence their barrenneſs, without being abſolute, may be regarded as poſitive; ſince their productions are ſo rare, that a few examples can be only collected.

The tranſlator of Buffon's works, in a note on the paſſage above quoted, has given a remarkable and well authenticated inſtance of the prolific powers of a ſhe-mule in the north of Scotland. Having heard that a mule belonging to Mr David Tullo farmer in Auchtertyre in the county of Forfar, had ſome years ago brought forth a foal, he tranſmitted a few queries to be put to Mr Tullo; and requeſted that his anſwers might be legally atteſted before a magiſtrate. This requeſt was cheerfully complied with; and the following is an exact copy of the queries, anſwers, and atteſtations.

Interrogatories to be put to Mr Tullo tenant in Auchtertyre, pariſh of Newtyle, and county of Forfar, with his anſwers thereto.

1mo, Had you ever a ſhe-mule? At what period? Is it true that the mule had a foal? and what time was ſhe covered; and when did ſhe foal?—Anſwered by Mr Tullo: that he bought a ſhe-mule about 20 years ago: That ſhe was conſtantly in ſeaſon for a horſe: That, about ſome years thereafter, he gave her a horſe; and that ſhe thereafter gave him a foal, about the 10th of June. The mule's price was L. 4, 5s. Sterling.

2do, What was the colour of the foal? Was there any thing particular in its figure?—Anſwer: The foal was exactly the colour of its mother, inclined to black, with a very large head, big ears, and ſmall tail; and the declarant thinks, had its head been weighed when foaled, it would have weighed nearly as much as its body.

3tio, How long was the animal allowed to live?—Anſwer: The next day after the mule foaled, it was ſent, with its mother, to the Loch of Lundie, in order to let the foal die, as the declarant could not want the mule's work, and the mother ſeemed not fond of the foal: That it was accordingly left, and the next day came to Auchtertyre, about two miles diſtance, over a hill, with the cattle of Auchtertyre, that had been grazing near to that place, and was drowned in a ditch the day following.

4to. Was its ſkin preſerved, or the head, or any other bones of the ſkeleton? Could any part thereof be ſtill found? Anſwered: Neither the ſkin nor any part of the ſkeleton was preſerved, nor can be now had; though the declarant has often regretted the not preſerving the foal, as its mother always performed any work that a horſe of 15l. value could do.

5to, Is the mother ſtill alive? What is her age?—Anſwer: The mother died about eight years ago, of an epidemic cold that was raging among the horſes in this country: the mule had little or no milk after foaling, and the foal got ſome cows milk: And this is all that he remembers of the matter. David Tullo.

Auchtertyre. 4th Feb. 1780. We James Small tenant in Burmouth, and Robert Ramſay tenant in Newtyle, hereby certify, That we have often ſeen the mule above deſcribed; and we know that ſhe had a foal, as is narrated by David Tullo.

James Small. Rob. Ramsay.

Ballantyne-houſe, 4th Feb. 1780. The within interrogatories were put to David Tullo tenant in Auchtertyre, anent the mule he had, and the foal ſhe produced; to which he gave the anſwers ſubjoined to each query, and ſigned them; as did James Small and Robert Ramſay, atteſting the truth thereof, in preſence of George Watson, J. P.

The original atteſtation is in the poſſeſſion of the tranſlator; and he lately tranſmitted notorial or authenticated copies of it to the count de Buffon, and to Thomas Pennant, Eſq; of Downing, in Flintſhire.

Mules, among gardeners, denote a ſort of vegetable monſters produced by putting the farina fœcundans of one ſpecies of plant into the piſtil or utricle of another.

The carnation and ſweet-william being ſomewhat alike in their parts, particularly their flowers, the farina of the one will impregnate the other, and the ſeed ſo enlivened will produce a plant differing from either. An inſtance of this we firſt had in Mr Fairchild's garden at Hoxton; where a plant is ſeen neither ſweet-william nor carnation, but reſembling both equally: this was raiſed from the ſeed of a carnation that had been impregnated by the farina of the ſweet-william. Theſe couplings being not unlike thoſe of the mare with the aſs, which produce the mule, the ſame name is given them; and they are, like the others, incapable of multiplying their ſpecies.

This furniſhes a hint for altering the property and taſte of any fruit, by impregnating one tree with the farina of another of the ſame claſs; *e. gr.* a codlin with a pear-main, which will occaſion the codlin ſo impregnated to laſt a longer time than uſual, and to be of a ſharper taſte. Or if the winter-fruits be fecundated with the duſt of the ſummer kinds, they will ripen before their uſual time. And from this accidental coupling of the farina of one with another, it may poſſibly be, that an orchard where there is variety of apples, even the fruit gathered from the ſame tree differ in their flavour, and in the ſeaſon of maturity. It is alſo from the ſame accidental coupling that the numberleſs varieties of fruits and flowers raiſed every day from ſeed proceed.

Wild or Fecund Mule. See Equus, p. 712.

MULHAUSEN, an imperial and Hanſeatic town of Germany in Upper Saxony, and in Thuringia, under the protection of the elector of Saxony; ſeated in a fertile country, on the river Unſtrutht, 15 miles north eaſt of Eiſenach, and 45 eaſt by ſouth of Caſſel, E. Long. 10. 49. N. Lat. 51. 13.

Mulhausen, a conſiderable town of Germany, in Alſace, and capital of a republic in alliance with the Swiſs. It is populous, well built, and adorned with handſome public ſtructures; ſeated in a pleaſant fertile country, on an iſland formed by the river Ill, 15 miles north weſt of Baſle, and 20 eaſt of Befort. E. Long. 7. 24. N. Lat. 47. 48.

MULIER, in law, ſignifies the lawful iſſue born in wedlock, though begotten before. The mulier is preferred to an elder brother born out of matrimony; as for inſtance, if a man has a ſon by a woman before marriage, which iſſue is a baſtard, and afterwards marries the mother of the baſtard, and they have another ſon, this ſecond ſon is mulier and lawful, and ſhall be heir of the father; but the other can be heir to no perſon*. By the civil law, where a man has iſſue by a woman, if after that he marries her, the iſſue is mulier.

* See the article Baſtard.

MULL, one of the Weſtern Iſlands of Scotland, about 25 miles long, and as much in breadth. It is in general rocky and barren, not producing a ſufficient quantity of corn for the inhabitants; but a great number of cattle are annually exported, which with the fiſhings and a conſiderable quantity of kelp are the only articles of commerce. It is deeply indented with bays and creeks, forming in ſeveral parts good natural harbours. There are no villages except Tobermorey, near the northern point of the iſland, where a fiſhing ſtation has been lately erected. The iſland was originally part of the dominions of the Lords of the Iſles; but in after-times it became part of the poſſeſſions of the ancient and valiant family of Macleans, who ſtill retain one-half. The other is the litigated property of the duke of Argyle, whoſe anceſtor poſſeſſed himſelf of it in 1674, on account of a debt; but after the courts of law had made an adjudication in his favour, he was obliged to ſupport their decree by force of arms. The ruins of ſeveral ancient caſtles are ſeen on this iſland.

Mull of Cantyre. See Cantyre.

Mull of Galloway. See Galloway.

MULLEIN, See Virbascum.

MULLER or Regiomontanus (John), a celebrated aſtronomer of the 15th century, was born at Koningſhoven in Franconia in 1436, and acquired great reputation by publiſhing an abridgment of Ptolemy's Almageſt, which had been begun by Purback. He went to Rome to perfect himſelf in the Greek tongue, and to ſee the Cardinal Baſſarion; but finding ſome faults in the Latin tranſlations of George de Trebizond, that tranſlator's ſon aſſaſſinated him in a ſecond journey he made to Rome in 1476, where Pope Sextus IV. had provided for him the archbiſhopric of Ratiſbon, and had ſent for him to reform the calendar. Others ſay that he died of the plague.

Muller (John) a noted engraver, who flouriſhed about the year 1600, and had been bred under Henry Goltzius, whoſe ſtyle he cloſely imitated. The facility with which he handled the graver (for he worked with that inſtrument only) cannot be ſufficiently expreſſed; his works muſt be ſeen, to convey a proper idea of it to the mind. His engravings are valuable, as productions of a very extraordinary nature; excluſive of which they have a prodigious ſhare of merit. Among his moſt eſtimable performances may be mentioned, 1. The hand writing on the wall, a middling-ſized plate lengthwiſe, from his own compoſition. 2. The adoration of the wiſe men, the ſame, from the ſame. Fine impreſſions of both theſe prints are very rare. 3. The reſurrection of Lazarus, a large plate lengthwiſe, from Abraham Bloemart. He engraved alſo ſeveral much eſteemed portraits.

Muller, or *Mollar*, denotes a ſtone flat and even at bottom, but round at top; uſed for grinding of matters on a marble.—The apothecaries uſe mullers to prepare many of their teſtaceous powders; and painters for their colours, either dry or in oil.

Muller is an inſtrument uſed by the glaſs-grinders; being a piece of wood, to one end whereof is cemented the glaſs to be ground, whether convex in a baſon, or concave in a ſphere or bowl.—The muller is ordinarily about ſix inches long, turned round: the cement they uſe is compoſed of aſhes and pitch. See Grinding.

MULLERAS, a town of Germany, in the circle of Upper Saxony, and marquiſate of Brandenburg, ſeated 38 miles ſouth of Berlin, upon a canal which joins the Oder and the Spree. This canal is 15 miles in length, 10 yards in breadth, and ſeven feet in depth. It was eight years in making, and ſince that time the cities of Hamburg and Breſlaw have carried on great trade by water. E. Long. 14. 50. N. Lat. 52. 21.

MULLET, in ichthyology. See Mugil.

Mullet, or *Mollet*, in heraldry, a bearing in form of the rowel of a ſpur, which it originally repreſented.

MULLINGAR, a borough or mannor in the county of Weſtmeath, and province of Leinſter, in Ireland, 30 miles from Dublin. It is the ſhire town of that county, and has a barrack for two troops of horſe. It returns two members to parliament; patron the earl of Granard. This is a poſt town. N. Lat. 53. 30. W. Long. 7. 50. Within a few miles of it are the ruins of a church, and alſo thoſe of a caſtle. It is ſituated on the river Feyle. It holds a great wool fair, and is a place of good trade. In 1227, the priory of St Mary, formerly known by the name of *The Houſe of God of Mullingar*, was founded here by Ralph de Petyt biſhop of Meath, for regular canons of the order of St Auguſtin. A Dominican friary was alſo founded here in 1237 by the family of Nugent; ſome ruins of which ſtill remain. In 1622, the friars of Multifarnham began to erect a houſe here for friars of the order of St Francis, but it was never completed. Fairs are held here 6th April, 4th and 5th July, 29th Auguſt, and 11th November.

MULLUS, the Surmullet, in ichthyology, a genus of fiſhes belonging to the order of Thoracici. See Plate CCCXV. This fiſh was highly eſteemed by the Romans, and bore an exceedingly high price. The capricious epicures of Horace's days valued it in proportion to its ſize; not that the larger were more delicious, but that they were more difficult to be got.

The price that was given for one in the time of Juvenal and Pliny is a ſtriking evidence of the luxury and extravagance of the age:

> Mullum ſex millibus emit
> Æquantem ſane paribus ſeſtertia libris *. Juv. Sat. IV.
> The laviſh ſlave
> Six thouſand pieces for a mullet gave,
> A ſeſterce for each pound. Dryden.

Pennant. But Aſinius Celer, a man of conſular dignity, gave a ſtill more unconſcionable ſum; for he did not ſcruple beſtowing 8000 *nummi*, or 64 l. 11 s. 8 d. for a fiſh of ſo ſmall a ſize as the mullet: for, according to Horace, a *mullus trilibris*, or one of three lb. was a great rarity; ſo that Juvenal's ſpark muſt have had a great bargain in compariſon of what Celer had. But Seneca ſays, that it was not worth a farthing except it died in the very hand of your gueſt; that ſuch was the luxury of the times, that there were ſtews even in the eating-rooms, ſo that the fiſh could at once be brought from under the table, and placed on it; and that they put the mullets in tranſparent vaſes, that they might be entertained with the various changes of its rich colour while it lay expiring. Apicius, a wonderful genius for luxurious inventions, firſt hit upon the method of ſuffocating them in the exquiſite Carthaginian pickle, and afterwards procured a rich ſauce from their livers.—This is the ſame gentleman whom Pliny, in another place, honours with the title of *Nepotum omnium altiſſimus gurges*; an expreſſion too forcible to be rendered in our language. The body of this fiſh is very thick, and covered with large ſcales; beneath them the colour is a moſt beautiful roſy red, the changes of which under the thin ſcales gave that entertainment to the Roman epicures as abovementioned: the ſcales on the back and ſides are of a dirty orange; thoſe on the noſe a bright yellow; the tail a reddiſh yellow.

MULTIPLE, in arithmetic, a number which comprehends ſome other ſeveral times: thus 6 is a multiple of 2, and 12 is a multiple of 6, 4, and 3; comprehending the firſt twice, the ſecond thrice, &c.

Action of MULTIPLEPOINDING, in Scots law. See Law, nº clxxxiii. 24.

MULTIPLICAND, in arithmetic, the number to be multiplied by another. See Arithmetic.

MULTIPLICATION, in general, the act of increaſing the number of any thing.

Multiplication, in arithmetic, is a rule by which any given number may be ſpeedily increaſed, according to any propoſed number of times. See Arithmetic.

Multiplication, in algebra. See Algebra, p. 401.

MULTIPLICATOR, or Multiplier, in arithmetic, the number by which any other is multiplied, or the number of times it is ſuppoſed to be taken.

MULTIPLICATUS flos, a luxuriant flower, whoſe petals are multiplied ſo as to exclude a part of the ſtamina.

A multiplied luxuriant flower differs from a full one, the higheſt degree of luxuriance, in that the petals of the latter are ſo multiplied as to exclude all the ſtamina: whereas thoſe of the former are only repeated or multiplied, two, or three, or four times, as to the excluſion of only a ſmall part of the eſſential organs.

MULTIPLYING-glass, in optics, a glaſs wherewith objects appear increaſed in number. See (the *Index* ſubjoined to) Optics.

MULTURE, in Scots law, a certain ſtipulated quantity of meal given as payment to the proprietor or tackſman of a mill for grinding the corn: and all corn ground on farms thirled to the mill is obliged to pay multure whether the corn be ground at that mill or elſewhere.

MULVIA, a river of Barbary in Africa, which riſes in the mountains of Atlas, and divides the empire of Morocco from that of Algiers, and then falls into the Mediterranean, to the weſtward of Maralquiver.

MUM, a kind of malt-liquor much drunk in Germany, and chiefly brought from Brunſwick, which is the place of moſt note for making it. The proceſs of brewing mum, as recorded in the town-houſe of that city, is as follows. Take 63 gallons of water that has been boiled till one-third part is conſumed, and brew it with ſeven buſhels of wheaten malt, one buſhel of oat-meal, and one buſhel of ground beans. When it is tunned, the hogſhead muſt not be filled too full at firſt: as ſoon as it begins to work, put into it three pounds of the inner rind of fir, one pound of the tops of fir and beech, three handfuls of carduus benedictus, a handful or two of the flower of roſa ſolis: and burnet, betony, marjoram, avens, pennyroyal, and wild thyme, of each an handful aad an half; of elder flowers, two handfuls or more; ſeeds of cardamum bruiſed, 30 ounces; barberries bruiſed, one ounce: when the liquor has worked a while, put the herbs and ſeeds into the veſſel; and, after they are added, let it work over as little as poſſible; then fill it up: laſtly, when it is ſtopped, put into the hogſhead ten new-laid eggs unbroken; ſtop it up cloſe, and uſe it at two years end. The Engliſh brewers, inſtead of the inner rind of fir, uſe cardamum, ginger, and ſaſafras; and alſo add elecampane, madder, and red ſanders.

MUMIA. See Pissaphaltum.

MUMMIUS (L.), a Roman conſul ſent againſt the Achæans, whom he conquered B. C. 147. He deſtroyed Corinth, Thebes, and Chalcis, by order of the ſenate, and obtained the ſurname of *Achaicus* from his victories. He did not enrich himſelf with the ſpoils of the enemy, but returned home without any increaſe of fortune. He was ſo unacquainted with the value of the paintings and works of the moſt celebrated artiſts of Greece which were found in the plunder of Corinth, that he ſaid to thoſe who conveyed them to Rome, that if they loſt them or injured them, they ſhould make others in their ſtead.

MUMMY, a body embalmed or dried, in the manner uſed by the ancient Egyptians; or the compoſition with which it is embalmed. There are two kinds of bodies denominated *mummies*. The firſt are only carcaſes dried by the heat of the ſun, and by that means kept from putrefaction: theſe are frequently found in the ſands of Libya. Some imagine, that theſe are the bodies of deceaſed people buried there on purpoſe to keep them entire without embalming; others think they are the carcaſes of travellers who have been overwhelmed by the clouds of ſand raiſed by the hurricanes frequent in thoſe deſarts. The ſecond kind of mummies are bodies taken out of the catacombs near Cairo, in which the Egyptians depoſited their dead after embalming. See Embalming.

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* L. 48. 8 s. 9 d.

Mummy.

We have two different ſubſtances preſerved for medicinal uſe under the name of *mummy*, though both in ſome degree of the ſame origin. The one is the dried and preſerved fleſh of human bodies, embalmed with myrrh and ſpices; the other is the liquor running from ſuch mummies, when nearly prepared, or when affected by great heat or damps. The latter is ſometimes in a liquid, ſometimes of a ſolid form, as it is preſerved in vials well ſtopped, or ſuffered to dry and harden in the air. The firſt kind of mummy is brought to us in large pieces, of a lax and friable texture, light and ſpungy, of a blackiſh brown colour, and often damp and clammy on the ſurface: it is of a ſtrong but diſagreeable ſmell. The ſecond kind of mummy, in its liquid ſtate, is a thick, opaque, and viſcous fluid, of a blackiſh colour, but not diſagreeable ſmell. In its indurated ſtate, it is a dry ſolid ſubſtance, of a fine ſhining black colour, and cloſe texture, eaſily broken, and of a good ſmell; very inflammaeble, and yielding a ſcent of myrrh and aromatic ingredients while burning. This, if we cannot be content without medicines from our own bodies, ought to be the mummy uſed in the ſhops; but it is very ſcarce and dear; while the other is ſo cheap, that it will always be moſt in uſe.

All theſe kinds of mummies are brought from Egypt. But we are not to imagine, that any body breaks up the real Egyptian mummies, to ſell them in pieces to the druggiſts, as they make a much better market of them in Europe whole, when they can contrive to get them. What our druggiſts are ſupplied with, is the fleſh of executed criminals, or of any other bodies the Jews can get, who fill them with the common bitumen, ſo plentiful in that part of the world; and adding a little aloes, and two or three other cheap ingredients, ſend them to be baked in an oven, till the juices are exhaled, and the embalming matter has penetrated ſo thoroughly that the fleſh will keep and bear tranſporting into Europe. Mummy has been eſteemed reſolvent and balſamic: but whatever virtues have been attributed to it, ſeem to be ſuch as depend more upon the ingredients uſed in preparing the fleſh than in the fleſh itſelf; and it would ſurely be better to give thoſe ingredients without ſo ſhocking an addition,

There are found in Poland a kind of natural mummies, or human bodies preſerved without the aſſiſtance of art. Theſe lie in conſiderable numbers in ſome of the vaſt caverns in that country. They are dried with the fleſh and ſkin ſhrunk up almoſt cloſe to the bones, and are of a blackiſh colour. In the wars which ſeveral ages ago laid waſte that country, it was common for parties of the weaker ſide to retire into theſe caves, where their enemies, if they found them out, ſuffocated them by burning ſtraw, &c. at the mouth of the cavern, and then left the bodies; which, being out of the way of injuries from common accidents, have lain there ever ſince.

Mineral Mummy. See Pissaphaltum.

Mummy, among gardeners, a kind of wax uſed in grafting and planting the roots of trees, made in the following manner: Take one pound of black pitch, and a quarter of a pound of turpentine; put them together into an earthen pot, and ſet them on fire in the open air, holding ſomething in your hand to cover and quench the mixture in time, which is to be alternately lighted and quenched till all the nitrous and volatile parts be evaporated. To this a little common wax is to be added; and the compoſition is then to be ſet by for uſe.

Mumps, Munda.

MUMPS. See Medicine-*Index*.

MUNDA, an ancient town of Spain, in the kingdom of Granada, ſeated on the declivity of a hill, at the bottom of which runs a river. W. Long. 4. 13. N. Lat. 48. 15.

This city was anciently famous for a victory gained by Cæſar over the two ſons of Pompey, who had collected an army in Spain after the defeat of their father at Pharſalia. See *(Hiſtory of)* Rome.

The Pompeys poſted their army advantageouſly on a riſing ground, whereof one ſide was defended by the city of Munda, and the other by a ſmall river which watered the plain, and by a marſh; ſo that the enemy could not attack them but in front. Cæſar likewiſe drew up his troops with great art, and having advanced a little way from his camp, ordered them to halt, expecting the enemy would abandon their advantageous poſt, and come to meet him. But as they did not ſtir, Cæſar made as if he intended to fortify himſelf in that poſt; which induced the young general, who looked upon this as a ſign of fear, to advance into the plain, and attack the enemy before they could ſecure themſelves with any works. Pompey's army was by far the moſt numerous; for it conſiſted of 13 legions, 6000 horſe, and an incredible number of auxiliaries, among whom were all the forces of Bocchus king of Mauritania, commanded by his two ſons, both youths of great valour and bravery. Cæſar had 80 cohorts, three legions, to wit, the third, the fifth, and the tenth, and a body of 8000 horſe. As the enemy drew near, Cæſar betrayed a great deal of uneaſineſs and concern, as if he were doubtful of the ſucceſs, knowing he was to engage men no way inferior in valour and experience to his own, and commanded by officers who had on many occaſions given ſignal proofs of their bravery and conduct. Cneius, the elder of the two brothers, was generally looked upon as an able commander; and Labienus, who had revolted, eſteemed ſcarce inferior to himſelf.

However, the dictator, deſirous to put an end to the civil war, either by his own death or that of his rivals, gave the ſignal for the battle, and fell upon the enemy with his uſual vigour and reſolution. At the firſt onſet, which was dreadful, the auxiliaries on both ſides betook themſelves to flight, leaving the Romans to decide their quarrel by themſelves. Then the legionaries engaged with a fury hardly to be expreſſed; Cæſar's men being encouraged by the hopes of putting an end to all their labours by this battle, and thoſe of Pompey exerting themſelves out of neceſſity and deſpair, ſince moſt of them expected no quarter, as having been formerly pardoned. Never was victory more obſtinately diſputed. Cæſar's men, who had been always uſed to conquer, found themſelves ſo vigorouſly charged by the enemy's legionaries, that they began to give ground; and though they did not turn their backs, yet it was manifeſt that ſhame alone kept them in their poſts. All authors agree, that Cæſar had never been in ſo great danger; and he himſelf, when he came back to his camp, told his friends, that he had often fought for victory, but this was the firſt time he had ever fought for life. Thinking himſelf abandoned by fortune, which had hitherto ſavoured him, he had ſome thoughts of ſtabbing himſelf with his own ſword, and by a voluntary death preventing the diſgrace of a defeat; but returning ſoon to himſelf, and concluding it would be more to his reputation to fall by the enemy's hand at the head of his troops, than, in a fit of deſpair, by his own, he diſmounted from his horſe, and ſnatching a buckler from one of his legionaries, he threw himſelf like a man in deſpair into the midſt of the enemy; crying out to his men, *Are you not aſhamed to deliver your general into the hands of boys?* At theſe words, the ſoldiers of the tenth legion, animated by the example of their general, fell upon the enemy with freſh vigour, and made a dreadful havock of them. But in ſpite of their utmoſt efforts, Pompey's men ſtill kept their ground, and though greatly fatigued, returned to the charge with equal vigour, Then the Cæſarians began to deſpair of victory; and the dictator, running through the ranks of his diſheartened legionaries, had much ado to keep them together. The battle had already laſted from the riſing to the ſetting of the ſun, without any conſiderable advantage on either ſide.

At length a mere accident decided the diſpute in favour of the dictator. Bogud, a petty, king of Mauritania, had joined Cæſar ſoon after his arrival in Spain, with ſome ſquadrons of Numidian horſe; but, in the very beginning of the battle, being terrified at the ſhouting of the ſoldiers, intermingled with groans, and the claſhing of their arms, he had abandoned his poſt, and retired with the auxilliaries under his command to a riſing ground at a ſmall diſtance from the enemy's camp. There he continued the whole day an idle ſpectator of the battle that was fought in the plain. But towards the evening, partly out of ſhame and partly out of compaſſion for his friend Cæſar, he reſolved to fall upon Pompey's camp; and accordingly flew thither with all the forces he had with him. Labienus, appriſed of his deſign, haſtened after him to the defence of the camp; which Cæſar obſerving, cried to his legionaries, *Courage, fellow-ſoldiers! the victory at length is ours; Labienus flies.* This artifice had the deſired effect: Cæſar's men, believing that Labienus was truly fled, made a laſt effort, and charged the wing he commanded ſo briſkly, that after a moſt obſtinate diſpute they put them to flight.

Though the enemy's left wing was thus entirely defeated, the right wing, where the elder Pompey commanded ſtill kept their ground for ſome time. Pompey diſmounting from his horſe fought on foot like a private man in the firſt line, till moſt of his legionaries being killed, he was forced to ſave himſelf by flight from falling into the enemy's hands. Part of his troops fled back to their camp, and part took ſhelter in the city of Munda. The camp was immediately attacked, and taken ſword in hand; and as for the city, Cæſar, without loſs of time, drew a line of circumvallation round it. This victory was gained on the 16th of the kalends of April, *i. e.* according to our way of counting, on the 17th day of March, when the Dionyſian feſtival, or the Liberalia, were celebrated at Rome; the very day, as Plutarch obſerves, in which Pompey the Great, four years before, had ſet out for the war. In this action Pompey loſt 30,000 men; among whom were the famous Labienus, Attius Varus, and 3000 Roman knights. Seventeen officers of diſtinction were taken, and all the enemy's eagles and enſigns, together with Pompey's faſces, which he had aſſumed as governor of Spain. On Cæſar's ſide only 1000 men were killed and 500 wounded.

MUNDIC, or Marcasite. See Marcasite.

MUNDINGOES, the name of a people who live on the ſides of the river Gambia in Africa, and who are of a jet black colour, ſtrong, and well made. They have a prieſt ſent over every year from one of the Cape de Verde iſlands to chriſten and marry.

MUNDUS patens, the open world, in Roman antiquity, a ſolemnity performed in a ſmall temple, of a round form like the world, dedicated to *Dis* and the reſt of the infernal gods. This temple was opened but three times in the year, *viz.* the 24th of Auguſt, the 4th of October, and the 7th of November During theſe days, the Romans believed hell was open; on theſe days therefore they never offered battle, liſted ſoldiers, put out to ſea, or married.

MUNICH, a town of Germany, capital of the whole duchy of Bavaria, and the reſidence of the elector. It ſtands on the Iſer, 70 miles ſouth of Ratiſbon and 214 weſt of Vienna, being one of the moſt pleaſant and populous cities of Germany for its bigneſs. The number of the inhabitants is ſaid to be about 40,000. Having been built at firſt on a ſpot of ground belonging to a convent, it had from thence in German the name of *Munchen*, i. e. *Monk's-town*, and a monk for its arms. The elector's palace here is a very grand ſtructure, conſiſting of ſeveral courts, furniſhed and adorned in the moſt magnificent manner, with tapeſtry, gilding, ſculpture, ſtatues, and paintings. It contains an amazing collection of jewels, antiquities, and curioſities. The great hall is 118 feet long and 52 broad; and the ſtair-caſe leading to it, from top to bottom, of Marble and gold. In the hall of antiquities are 354 buſts and ſtatues of jaſper and porphyry, braſs and marble. In this palace alſo is a library, containing a vaſt collection of books, and many valuable manuſcripts, in moſt languages, ancient and modern; and a chamber of rarities, among which is the picture of a bravo or aſſaſſin, who is ſaid to have committed 345 murders with his own hand, and to have been accomplice in or privy to 400 more. The treaſury in the chapel contains alſo a vaſt number of pictures, precious ſtones, medals, veſſels of gold and ſilver,, &c. Among other curioſities, here is a cherry-ſtone with 140 heads diſtinctly engraven upon it. The gardens of the palace are alſo very fine, and it is ſaid a ſecret paſſage leads from it to all the churches and convents in the town. There is a great number of other fine buildings in this city, public and private, particularly the riding-houſe, town houſe, opera-room, the Jeſuits college, the large edifice for tournaments, the churches, convents, fountains, &c. Its manufactures are thoſe of ſilk, particularly velvet, woollen cloths, and tapeſtry; and it has two annual fairs, at which great quantities of ſalt, wine, &c. are ſold. The ſtreets are broad and regular; and moſt of the houſes well built, and painted on the outſide. The market place is extremely beautiful. Not far from Munich are four other palaces, with fine gardens, belonging to the elector, *viz.* thoſe of Sleiſheim, Nymphenburg, Dauchau, and Starenberg. The firſt and laſt are about three leagues from the capital; the ſecond about half a league; and the third about two, at a market town of the ſame name.

Munich (Count de), was the favourite of the Czarina Ann, and was concerned in all the events of her reign. Being appointed general of her armies, he gained great advantages over the Crim Tartars, beat the Turks, A. D. 1739, in an engagement near Choczim, and took that city together with Jaſſi the capital of Moldavia. He was afterwards prime miniſter to the Czar Iwan VI. but in a ſhort time after he was accuſed of employing the power which his office conferred on him to gratify his own ambition and private reſentment. The Empreſs Eliſabeth brought him to trial, and he was condemned to loſe his life A. D. 1742. This ſentence was mitigated to baniſhment into Siberia, whither many of the victims of his power had been exiled. He was recalled by Peter III. A.D. 1762, and declared field-marſhal. Upon the death of this prince, the Empreſs Catharine II. appointed him director-general of the ports of the Baltic. He died on the 8th of October 1767, at the age of 84.

MUNICIPAL, in the Roman civil law, an epithet which ſignifies inveſted with the rights and privileges of Roman citizens. See Municipium.

Municipal, among us, is applied to the laws that obtain in any particular city or province. And thoſe are called *municipal officers* who are elected to defend the intereſt of cities, to maintain their rights and privileges, and to preſerve order and harmony among the citizens; ſuch as mayors, ſheriffs, conſuls, &c.

MUNICIPES, an appellation given by the Romans to the inhabitants of the *municipia* or municipal cities. See Municipium.

MUNICIPIUM, in Roman antiquity, a corporation, borough, or enfranchiſed city or town, where the inhabitants enjoyed their own laws and cuſtoms, and at the ſame time were honoured with the privileges of Roman citizens; but then this privilege generally reached no further than the bare title. Some indeed, by particular merit, obtained the liberty of votes, which occaſioned that diſtinction of *municipium ſine ſuffragio*, and *municipium cum ſuffragio*.—The inhabitants of the *municipium ſine ſuffragio*, were called barely *Romani*, but thoſe of the *municipium cum ſuffragio* were called *cives Romani*.

The difference between proper citizens of Rome and the inhabitants of the municipium may be thus expreſſed. The proper citizens of Rome were, 1. Regiſtered in the cenſus; 2. Had the right of ſuffrage and of bearing honours; 3. Were aſſeſſed in the poll-tax; 4 Served in the legions; 5. Uſed the Roman laws and religion; 6. Were called *Quirites* and *populus Romanus*: Whereas the municipes enjoyed the three firſt of theſe privileges but were denied the three laſt.

MUNITION, the proviſions with which a place is furniſhed in order for its defence; or that which follows a camp for its ſubſiſtence.

Munition-ſhips are thoſe that have ſtore on board in order to ſupply a fleet of men of war at ſea. In an engagement, all the munition-ſhips and victuallers attending the fleet take their ſtation in the rear of all the reſt, they are not to engage in the fight, but to attend to ſuch directions as are ſent them by the admiral.

MUNSTER (Sebaſtian), a learned writer, was born at Ingleheim, and became a Cordelier; but having embraced Luther's ſentiments, he quitted that order in 1529, and retired to Heidelberg, and afterwards to Baſil, where he taught with reputation. He was a man of great candour, and void of ambition; and was ſo well ſkilled in geography, the mathematics, and the Hebrew tongue, that he was ſurnamed the *Eſdras* and the *Strabo of Germany*. His Latin tranſlation of the bible is eſteemed. He was the firſt who wrote a Chaldee grammar and lexicon; he alſo publiſhed a treatiſe on coſmography, and ſeveral other works. He died of the plague at Baſil in 1552, aged 63.

Munster, in Latin *Momonia*, and in Iriſh *Mown*, the moſt ſoutherly province of Ireland; bounded on the north by Leinſter and Connaught, and on the eaſt, weſt, and ſouth, by the ocean. It contains the counties Cork, Clare, Kerrey, Limerick, Tipperary, and Waterford; and 3,289,932 Iriſh plantation acres, 740 pariſhes, 63 baronies, and 26 boroughs. It is about 125, miles long, and 120 broad: and its principal town is Cork. Its ancient name was *Mumhan*; and in latter ages it was divided into *Deſmond* or ſouth Munſter, *Ormond* or eaſt Munſter, and *Thomond* or north Munſter. It lies between 51. 15. and 53. 0. N. Lat. and 7. 10. to 10. 30 W. Long.

Munster, a territory of Germany, in the circle of Weſtphalia; bounded on the north by Embden and Oldenburg, on the ſouth by the county of Mark and duchy of Weſtphalia, on the weſt by the county of Bentheim and the United provinces, and on the eaſt by the biſhoprics of Oſnaburg and Paderborn together with the county of Ravenſberg. It is the largeſt of all the Weſtphalian biſhoprics, being in length about 80 miles, and in breadth from 20 to 60. It is divided into 13 bailiwicks; and though in general but a barren county, has ſome fruitful plains, with woods, and quarries of ſtone. The inhabitants, excepting a few of the nobility and gentry, are all Roman Catholics; though Lutheraniſm had once a conſiderable footing here. The biſhop, who is generally alſo elector of Cologne, has a revenue from hence of about 70,000 pounds, and can maintain 8000 men. In conſequence of an unjuſt cuſtom, unknown in the reſt of the empire, he is heir to all ſtrangers who die in the country without children. In the matricula he is rated at 30 foot and 118 horſe; or 832 florins monthly in lieu of them. His chapter conſiſts of 40 canons, who are all noble.

Munster, a city of Germany, capital of a biſhopric of the ſame name and of all Weſtphalia, ſtands at the conflux of the river Aa with the Ems, in E. Long. 7. 49. N. Lat. 52. 0. It is of a circular form, large, and well fortified both by nature and art. It has a fine citadel called the *Brille*, erected by a biſhop named *Bernard van Galen* in order to awe the burghers. The dean and chapter now elect the biſhop; but till the beginning of the 13th century he was nominated by the emperor. This city has been rendered famous by three remarkable tranſactions. 1. By the peace concluded here 1648, which put an end to a war of 30 years; occaſioned by the perſecuting ſpirit of bigotted papiſts, who choſe rather to plunge their country into all the calamities of war than allow liberty of conſcience to the Proteſtants. By this peace, however,

ever, they conſented, much againſt their inclination to grant them a toleration. 2. By the diſorders and diſturbances occaſioned here in 1553, by a parcel of enthuſiaſts, headed by a taylor called *John of Leyden* from the place of his birth, who turned out the magiſtrates, and took poſſeſſion of the city, where they perpetrated the moſt horrid villanies and cruelties. 3. For the noble, though unſucceſsful, efforts it made in defence of its liberties againſt the tyranny and uſurpation of the above-mentioned turbulent and bloody-minded biſhop, Bernard van Galen. In this city are a great number of convents and other religious houſes, many of them ſtately piles, and ſurrounded with beautiful gardens.

MUNYCHIA, or *Munychius Portus*, (anc. geog.), a village and port of Athens, nearer to the city, leſs than, and fortified in the ſame manner with the Piræus, to the eaſt of which it lay, or between it and the promontory Sunium, at the mouth of the Iliſſus. Strabo ſays it was an eminence in form of a peninſula, at the foot of which ſtood three harbours, anciently encompaſſed with a wall, taking within its extent the Piræus and other harbours, full of docks, with the temple of Diana, Munychia; taking its name from *Mynichus* the founder of the temple.

Munchyia, an anniverſary ſolemnity obſerved at Athens in honour of Diana, on the 16th of the month Munychion. Cakes were offered on the occaſion called αμφιφαντες.

MUNYCHION, the tenth month of the Athenian year, containing 29 days, and anſwering to the latter part of our March and the beginning of April. It was ſo called from the feſtival Munychia, which was obſerved in this month. See Month and Munychya.

MUPHTI. See Mufti.

MURÆNA, or Eel, in ichthyology; a genus of fiſhes, belonging to the order of apodes. The head is ſmooth; there are ten rays in the membrane of the gills; the eyes are covered with a common ſkin: and the body is cylindrical and ſlimy. There are ſeven ſpecies, diſtinguiſhed by their fins, tails, &c. The moſt remarkable are,

1. The *anguilla*, or common eel, is very frequent in moſt freſh waters, ponds, ditches, and rivers: according to Mr Pennant, it is the moſt univerſal of fiſh; yet is ſcarce ever found in the Danube, though very common in the lakes and rivers of Upper Auſtria.

The eel is very ſingular in many things relating to its natural hiſtory, and in ſome reſpects borders on the nature of the reptile tribe. It is known to quit its element, and during night to wander along the meadows, not only in order to change its habitation but alſo for the ſake of prey, feeding on ſnails, as it paſſes along. During winter it beds itſelf deep in the mud, and continues in a ſtate like the ſerpent-kind. It is very impatient of cold, and will eagerly take ſhelter in a wiſp of ſtraw flung into a pond in ſevere weather, which has ſometimes been practiſed as a method of taking them. Albertus affirms, that he has known eels to take ſhelter in a hay-rick; yet all periſhed through exceſs of cold. It has been obſerved in a river of England called the *Nyne*, there is a variety of ſmall eel, with a leſſer head and narrower mouth than the common kind, that is found in cluſters in the bottom of the river, and is called the *bed-eel:* theſe are ſometimes rouſed up by the violent floods, and are never found at that time with meat in their ſtomach.

Eels are extremely voracious, and deſtructive to the fry of others. No fiſh lives ſo long out of water as the eel; and it is ſo extremely tenacious of life, that its parts will move a conſiderable time after they are flayed and cut to pieces. They vary much in their colours, from a ſooty hue to a light olive green: and thoſe which are called *ſilver eels* have their bellies white, and a remarkable clearneſs throughout. Beſides theſe, there is a variety of this fiſh known in the river Thames by the name of *grigs*, and about Oxford by that of *grigs* or *gluts*. Theſe are ſcarce ever ſeen near Oxford in the winter; but appear in ſpring, and bite readily at the hook, which common eels in that neighbourhood will not. They have a larger head, a blunter noſe, thicker ſkin, and leſs fat, than the common ſort; neither are they ſo much eſteemed, nor do they often exceed three or four pounds in weight.—Common eels grow to a large ſize, ſometimes weighing 15 or 20 pounds; but that is extremely rare. Mr Dale indeed, in the Philoſophical Tranſactions, and ſome others, bring inſtances of eels much exceeding that ſize; but Mr Pennant ſuſpects them to have been congers, ſince the enormous fiſh they deſcribe have all been taken at the mouths of the Thames or Medway. The Romans held eels very cheap, probably on account of their likeneſs to ſnakes. On the contrary, the luxurious Sybarites were ſo fond of theſe fiſh, as to exempt from tribute of every kind perſons who ſold them.

There is ſcarce any animal the generation of which has puzzled the learned more than this. Ariſtotle firſt broached an opinion that eels were of no ſex, nor did propagate their ſpecies like other animals, but were equivocally gendered of the mud; and as wild and abſurd a ſyſtem as this is, there have not been wanting many, even in theſe latter and more enlightened times, who have given into it. But there is now no room to doubt that all animals are produced by the copulation of parents like themſelves; and the finding of eels in new ponds is eaſily accounted for from the above mentioned circumſtance of their migration. Dr Plot, and many others, have given accounts of whole droves of them leaving one ditch or pond to go to another.

Though the learned world at this time generally allows that eels are produced like other animals by parents of their own kind, yet there remain many doubts about the manner in which the generation is performed. Some allow the eels to be, like the generality of other animals, of different ſexes in the different individuals; and others affirm that they are all hermaphrodites, each having the parts of generation of both ſexes. Rondeletius affirms that they are of both ſexes; and Mr Allen, who has given a very curious paper concerning them in the Philoſophical Tranſactions, is of the ſame opinion; and both ſay, that the parts of the ſexes may be diſcovered on a careful inſpection; and ſome are found to be males, and others females; but theſe parts are, in both ſexes they ſay, buried in a large quantity of fat; and they are of opinion, that hence proceeded the miſtake of Ariſtotle and his followers, who, not being able to find thoſe parts, concluded that they did not exiſt at all. Among thoſe who allow the eel to be produced, like other animals, from animal-parents which have the ſexes, ſome are of opinion that they are viviparous, and others that they are oviparous; but Mr Chartwynd ſeems to have determined this controverſy by obſerving, that if the aperture under the belly of the eel, which looks red in the month of May, be cut open at that time, the young eels will be ſeen to come forth alive after the operation. Mr Lewenhoeck ſays, that he found an uterus in every eel he examined: and therefore concludes that they are hermaphrodites; and he ſuppoſes that they have no male parts of generation like thoſe of other animals; but that the office of theſe is performed by a liquor analagous to the male ſeed of animals, which is contained in certain glands, ſituated in the inſide of the uterus itſelf.

Eels have ſometimes been met with in recent ponds, made at ſuch a diſtance from any other water that we cannot reaſonably ſuppoſe them to have migrated thither over land. But in theſe caſes there is reaſon to believe, that the ponds have been ſupplied with them by the aquatic fowls of prey, in the ſame manner as vegetation is ſpread by many of the land-birds, either by being dropped, as they carry them to feed their young, or by paſſing quick through their bodies, as is the caſe with herons.

2. The *conger*, or conger-eel, grows to a vaſt ſize. Dr Borlaſe informs us, that they are ſometimes taken near Mount's-bay of 100 lb. weight; and Mr Pennant aſſures us, that he has heard of ſome taken near Scarborough that were 10 feet and a half long, and 18 inches in circumference in the thickeſt part. They differ from the common eel in the following particulars: 1. Their colour in general is more dark. 2. Their eyes much larger in proportion.—3. The irides of a bright ſilvery colour. 4. The lower jaw is rather ſhorter than the upper. 5. The inſide-line is broad, whitiſh, and marked with a row of ſmall ſpots. 6. The edges of the dorſal and anal fins are black. 7. They have more bones than the common eel, eſpecially along the back quite to the head. 8. They grow to a much larger ſize.

Congers are extremely voracious, preying on other fiſh, and on crabs at the time they have loſt their ſhell and are in a ſoft ſtate. They and eels in general are alſo particularly fond of carcaſes of any kind, being frequently found lodged in ſuch as are accidentally taken up.

The conger eels probably generate like the freſh-water ſpecies. Innumerable quantities of what are ſuppoſed to be their fry come up the Severn about the month of April, preceding the ſhads, which it is conjectured migrate into that river to feed on them; they are called *elvers*. They ſwarm during their ſeaſon, and are taken in a kind of a ſieve made of hair-cloth fixed to a long pole; the fiſherman ſtanding on the edge of the water during the tide, puts in his net as far as he can reach, and drawing it out again, takes multitudes at every ſweep, and will take as many during one tide as will fill a buſhel. They are dreſſed, and reckoned very delicate.

Theſe fiſh are an article of commerce in Cornwall; numbers are taken on that coaſt, and exported to Spain and Portugal, particularly to Barcelona.—Some are taken by a ſingle hook and line, but (becauſe that way is tedious, and does not anſwer the expence of time and labour) they are chiefly caught by *bulters*, which are ſtrong lines 500 feet long, with 60 hooks, each eight feet aſunder, baited with pilchards or mackarels; the bulters are ſunk to the ground by a ſtone faſtened to them: ſometimes ſuch a number of theſe are tied together as to reach a mile. The fiſhermen are very fearful of a large conger, leſt it ſhould endanger their legs by clinging round them; they therefore kill them as ſoon as poſſible by ſtriking them on the navel. They are afterwards cured in this manner: They are ſlit, and hung on a frame till they dry, having a conſiderable quantity of fat, which it is neceſſary ſhould exſude before they are fit for uſe. It is remarkable that a conger of 100 weight will waſte by drying to 24lb; the people therefore prefer the ſmalleſt, poſſibly becauſe they are ſooneſt cured. During the proceſs there is a conſiderable ſtench; and it is ſaid that in the fiſhing villages the poultry are fed with the maggots that drop from the fiſh. The Portugueſe and Spanairds uſe thoſe dried congers after they have been ground into a powder, to thicken and give a reliſh to their ſoups. They are ſold for about 40 ſhillings the quintal, which weighs 126lb. A fiſhery of congers, ſays Mr Pennant, would be of great advantage to the inhabitants of the Hebrides. Perhaps they would at firſt undertake it with repugnancy, from their abſurd averſion to the eel kind.

3. The *ſiren*, or mud niguana, a ſingular animal, firſt obſerved by Dr Garden of Charleſtown, and afterwards deſcribed by Mr Ellis in the Philoſophical Tranſactions for 1766. It has gills, fins, and two feet; and is in length from 31 to 40 inches. It is an inhabitant of South Carolina, where it is found in ſwampy and muddy places, by the ſides of pools, and under the trunks of old trees that hang over the water, and feeds on ſerpents. The feet appear like little arms and hands, each furniſhed with four fingers, and each finger with a claw. "The head is ſomething like an eel, but more compreſſed; the eyes are ſmall and placed as thoſe of the eel are. This ſmallneſs of the eye beſt ſuits an animal that lives ſo much in mud. The noſtrils are very plainly to be diſtinguiſhed: theſe, with the gills, and remarkable length of the lungs, ſhow it to be a true amphibious animal.—The mouth is ſmall in proportion to the length of the body; but its palate and inſide of the lower jaw are well provided with many rows of pointed teeth; with this proviſion of nature, added to the ſharp exterior bony edges of both the upper and under jaw, the animal ſeems capable of biting and grinding the hardeſt kind of food. The ſkin, which is black and full of ſmall ſcales, reſembles ſhagreen. Theſe ſcales are of different ſizes and ſhapes, according to their ſituation; but all appear ſunk into its gelatinous ſurface; thoſe along the back and belly are of an oblong oval form, and cloſe ſet together; in the other parts they are round, and more diſtinct. Both the parts are mottled with ſmall white ſpots, and have two diſtinct lines compoſed of ſmall white ſtreaks continued along from the feet to the tail. The fin of the tail has no rays, and is no more than an adipoſe membrane like that of the eel."

Dr Garden, in a letter to Mr Ellis, mentions a remarkable property of this animal, which is, that his ſervant endeavouring to kill one of them by daſhing

Plate CCCXV.

it againſt the ſtones, it broke into three or four pieces. Linnæus, from the deſcriptions ſent him, made it a new genus named *Syren*, of a new order *Meantes*, of the claſs amphibia. But from this claſs both the order *Meantes* and that of *Nantes* have been lately expunged; and Gmelin has reduced the ſyren to a ſpecies of the preſent genus. Its place here, however, ſeems ſtill of doubtful propriety; as Gmelin himſelf acknowledges in the Preface to his edition of the Syſtema Naturæ. For Campſer, having lately * had an opportunity to diſſect the ſyren, has diſcovered, that on each ſide of the head it is furniſhed with three true gills, ſeparated from each other by membranes having tooth-like appendages; that the mouth is armed with ſtrong and firmly planted teeth; that the heart has only one ventricle; and that the abdomen is filled with very long and capacious inteſtines; From all theſe circumſtance, he concludes, that this animal ought to be conſidered as a fiſh of the order *Branchioſtegi*;—while in other reſpects it is more nearly allied to the genus *Muræna*, of the order *Apodes*; although it differs materially from the other ſpecies of that genus, by having only three notched bones in the gills, and from the pectoral fins being each divided into four finger-like appendages,

MURAL, ſomething belonging to a wall; which the Latins call *murus*,

Mural-Crown, among the ancient Romans. See Crown.

Mural-Arch, is a wall, or walled arch, placed exactly in the plane of the meridian, *i. e.* upon the meridian line, for the fixing of a large quadrant, ſextant, or other inſtrument, to obſerve the meridian altitudes, &c. of the heavenly bodies.

Tycho Brahe was the firſt who uſed a mural arch in his obſervations: after him Hevelius, Mr Flamſtead, De la Hire, &c. uſed the ſame means. See Astronomy.

MURALT (N— de), a native of Switzerland, travelled through a great part of Europe with the views of a philoſopher. He publiſhed a collection of *Lettres ſur les François et ſur les Anglois*, 12mo, 2 vols. 1726, which met with great ſucceſs, though they are written in a vague and ſuperficial manner. Some other works which he publiſhed are below mediocrity, He died about the year 1750.

MURENT (Emanuel), a much-admired landſcape painter, was born at Amſterdam in 1622. He had the happineſs to be a diſciple of Philip Wouwermans, from whom he acquired that warmth and briliancy of colouring, and that exquiſite pencil, which have rendered him deſervedly eminent. His ſubjects were views in Holland, villages, towns, cities, ruins of houſes, and decayed caſtles? all of them exactly ſketched after nature, and ſo exquiſitely finiſhed, that every minute part of a building was perfectly diſcernible, and even every particular ſtone or brick might be counted by the aſſiſtance of a convex glaſs. But this demanded ſo much patience and time, that it was impoſſible for him to paint many pictures, and on that account they are exceedingly ſcarce, and ſold for ſuch prices as muſt place them out of the reach of all ordinary purchaſers. He died in 1700.

MURANUM, (anc. geog.), a town on the confines of Lucania. Now *Morano*; a citadel in the Calabria Citra, at the ſprings of the Sybaris, midway between the Sinus Tarentinus to the eaſt, and the Tuſcan ſea to the weſt. Suppoſed to have ariſen from the ruins of Sypheum, a town of the Bruttii mentioned by Livy.

MURATORI (Lewis Anthony), a learned and celebrated Italian writer, born at Vignoles, in the territory of Bologna, in 1672. He early diſcovered an extreme fondneſs for the learned languages and ſciences; and this was ſeconded by an excellent education. After having completed his firſt ſtudies, he embraced the ſtate of an eccleſiaſtic; and applied himſelf to polite literature, philoſophy, theology, civil law, antiquities, and other ſciences; by which means he became in a manner univerſally learned. He was ſcarce 22 years of age when he was made librarian of the Ambroſian library at Milan. In 1700 the duke of Modena, his ſovereign recalled him, and made him his librarian, and keeper of the archives of his duchy. Muratori diſcharged this double employment during the reſt of his life, and had no other benefice than the provoſtſhip of Santa Maria del Pomposa. He acquired the eſteem of the learned throughout Europe, who had recourſe to him for the lights they wanted. He became an aſſociate to the Academies of the Arcades of Rome, Della Cruſca, and Colomberia of Florence, the Academy of Etruſca at Cortona, the Royal Society of London, and of the imperial Academy of Olmutz; and died in 1750. He wrote a great number of learned works; the principal of which are,—1. *Anecdota*, or a collection of pieces taken from the Ambroſian library, 2 vols 4to, with learned notes and diſſertations. 2. A treatiſe on the perfection of the Italian poetry, 2 vols 4to. 3. *Anecdota Græca*, 3 vols 4to. 4. A genealogical hiſtory of the houſe of Modena, 2 vols folio. 5. An excellent collection of the writers of the Italian hiſtory, 27 vols folio, with learned notes. 6. Another collection, under the title of *Antiquitates Italicæ*. 7. A collection of ancient inſcriptions, under the title of *Novus Theſaurus*, 6 vols folio. 8. The annals of Italy, 12 vols 4to, in Italian, &c. 9. Letters, diſſertations, Italian poems, &c.

MURCIA, the pagan goddeſs of idleneſs.—The name is taken from *murcus* or *murcidus*, an obſolete word, ſignifying a dull, ſlothful, or lazy perſon.—The ſtatues of this goddeſs were always covered with duſt and moſs, to expreſs her idleneſs and negligence. She had a temple in Rome at the foot of the Aventine mount.

Murcia, a kingdom in Spain, bounded on the north by New Caſtile, on the eaſt by the kingdom of Valencia, on the weſt by Andaluſia and Granada, and on the ſouth by the Mediterranean Sea. It is about 62 miles in length, and 58 in breadth; and its principal river is Segura. The ſoil is dry, becauſe it ſeldom rains, and therefore it produces little corn or wine; but there is plenty of oranges, citrons, lemons, olives, almonds, mulberries, rice, pulſe, and ſugar. It has alſo a great deal of ſilk. It was taken from the Moors in 1265. The air is very healthful.

Murcia, a large handſome, and populous town of Spain, capital of a kingdom of the ſame name. It is a biſhop's ſee, and contains ſix pariſhes. The cathedral is a moſt ſuperb edifice, with the ſtairs of the ſteeple ſo contrived that a man may ride up to the top, either on horſeback or in a coach. It is ſituated in a pleaſant plain, which abounds in fine gardens about the city, in which are the beſt fruits in Spain. It is ſeated on the river Segura, in W. Long. 0. 36. N. Lat. 37. 48.

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* Kerr's Tranſlation.

MURDER, or MURTHER, the act of killing another with violence and injuſtice. The word comes from the Saxon *morth* "death;" which ſome will have to ſignify a violent death; whence the barbarous Latin *murdrum* and *mordrum*.

Among the number of popular errors, is the notion which has obtained, that the dead body would bleed in the preſence or upon the touch of the murderer.

The crime of murder is puniſhed with death in almoſt all nations.

MURDER, or *Murther*, in law, is thus defined or rather deſcribed, by Sir Edward Coke: "When a perſon, of ſound memory or diſcretion, unlawfully killeth any reaſonable creature in being, and under the king's peace, with malice aforethought, either expreſs or implied." The beſt way of examining the nature of this crime will be by conſidering the ſeveral branches of this definition.

1. It muſt be committed by a perſon *of ſound memory and diſcretion;* for lunatics or infants are incapable of committing any crime; unleſs in ſuch caſes where they ſhow a conſciouſneſs of doing wrong, and of courſe a diſcretion or diſcernment between good and evil.

Blackſt. Comment.

2. Next, it happens when a perſon of ſuch ſound diſcretion *unlawfully killeth.* The unlawfulneſs ariſes from the killing without warrant or excuſe; and there muſt alſo be an actual killing to conſtitute murther; for a bare aſſault, with intent to kill, is only a great miſdemeſnor, though formerly it was held to be murder. The killing may be by poiſoning, ſtriking, ſtarving, drowning, and a thouſand other forms of death, by which human nature may be overcome. Of theſe the moſt deteſtable of all is poiſon; becauſe it can of all others be the leaſt prevented, either by manhood or forethought. And therefore, by the ſtat. 22 Hen. VIII. c. 9. it was made treaſon, and a more grievous and lingering kind of death was inflicted on it than the common law allowed; namely, *boiling to death;* but this act did not live long, being repealed by 1 Edw. VI. c. 12. There was alſo by the ancient common law, one ſpecies of killing held to be murder, which may be dubious at this day, as there hath not been an inſtance wherein it has been held to be murder for many ages paſt, viz. bearing falſe witneſs againſt another, with an expreſs premeditated deſign to take away his life, ſo as the innocent perſon be condemned and executed. The Gothic laws puniſhed in this caſe both the judge, the witneſſes, and the proſecutor; and, among the Romans, the *lex Cornelia de ſaccariis*, puniſhed the falſe witneſs with death, as being guilty of a ſpecies of aſſaſſination. And there is no doubt but this is equally murder *in foro conſcientiæ* as killing with a ſword; though the modern law (to avoid the danger of deterring witneſſes from giving evidence upon capital proſecutions, if it muſt be at the peril of their own lives) has not yet puniſhed it as ſuch. If a man, however, does ſuck an act, of which the probable conſequence may be and eventually is, death; ſuch killing may be murder, although no ſtroke be ſtruck by himſelf, and no killing may be primarily intended: as was the caſe of the unnatural ſon who expoſed his ſick father to the air againſt his will, by reaſon whereof he died; and of the harlot, who laid her child under leaves in an orchard, where a kite ſtruck it and killed it. So too, if a man hath a beaſt that is uſed to do miſchief; and he, knowing it, *ſuffers* it to go abroad, and it kills a man; even this is manſlaughter in the owner: but if he had purpoſely *turned it looſe*, though barely to frighten people and make what is called *ſport*, it is with us (as in the Jewiſh law) as much murder as if he had incited a bear or or a dog to worry them. If a phyſician or ſurgeon gives his patient a potion or plaſter to cure him, which, contrary to expectation kills him, this is neither murder nor manſlaughter, but miſadventure; and he ſhall not be puniſhed criminally, however liable he might formerly have been to a civil action for neglect or ignorance: but it hath been holden, that if it be not a *regular* phyſician or ſurgeon who adminiſters the medicine, or performs the operation, it is manſlaughter at the leaſt. Yet Sir Matthew Hale very juſtly queſtions the law of this determination; ſince phyſic and ſalves were in uſe before licenſed phyſicians and ſurgeons; wherefore he treats this doctrine as apocryphal, and fitted only to gratify and flatter licentiates and doctors in phyſic; though it may be of uſe to make people cautious and wary how they meddle too much in ſo dangerous an employment. In order alſo to make the killing murder, it is requiſite that the party die within a year and a day after the ſtroke received, or cauſe of death adminiſtered; in the computation of which the whole day upon which the hurt was done ſhall be reckoned the firſt

3. Farther: The perſon killed muſt be "*a reaſonable creature in being, and under the king's peace*," at the time of the killing. Therefore to kill an alien, a Jew, or an outlaw, who are all under the king's peace or protection, is as much murder as to kill the moſt regular-born Engliſhman; except he be an alien-enemy, in time of war. To kill a child in its mother's womb, is now no murder, but a great miſpriſion: but if the child be born alive, and dieth by reaſon of the potion or bruiſes it received in the womb, it ſeems, by the better opinion, to be murder in ſuch as adminiſtered or gave them. As to the murder of baſtard-children, ſee BASTARD.

4. Laſtly, the killing muſt be committed "*with malice aforethought*," to make it the crime of murder. This is the grand criterion which now diſtinguiſhes murder from other killing; and this malice prepenſe *malitia præcogitata*, is not ſo properly ſpite or malevolence to the deceaſed in particular, as any evil deſign in general; the dictate of a wicked, depraved, and malignant heart; *un diſpoſition a faire un male choſe:* and it may be either *expreſs*, or *implied*, in law. Expreſs malice is when one, with a ſedate deliberate mind and formed deſign, doth kill another: which formed deſign is evidenced by external circumſtances diſcovering that inward intention; as lying in wait, antecedent menaces, former grudges, and concerted ſchemes to do him ſome bodily-harm. This takes in the caſe of deliberate dueling, where both parties meet avowedly with an intend to murder: thinking it their duty, as gentlemen, and claiming it as their right, to wanton

with their own lives and thoſe of their fellow-creatures; without any warrant or authority from any power either divine or human, but in direct contradiction to the laws both of God and man: and therefore the law has juſtly fixed the crime and puniſhment of murder on them, and on their ſeconds alſo. Yet it requires ſuch a degree of paſſive valour to combat the dread of even undeſerved contempt, ariſing from the falſe notions of honour too generally received in Europe, that the ſtrongeſt prohibitions and penalties of the law will never be entirely effectual to eradicate this unhappy cuſtom, till a method be found out of compelling the original aggreſſor to make ſome other ſatisfaction to the affronted party, which the world ſhall eſteem equally reputable as that which is now given at the hazard of the life and fortune, as well of the perſon inſulted, as of him who hath given the inſult. Alſo, if ever upon a ſudden provocation one beats another, in a cruel and unuſual manner, ſo that he dies, though he did not intend his death, yet he is guilty of murder by expreſs malice; i. e. by an expreſs evil deſign, the genuine ſenſe of *malitia*. As when a park-keeper tied a boy that was ſtealing wood to a horſe's tail, and dragged him along the park; when a maſter corrected his ſervant with an iron bar, and a ſchoolmaſter ſtamped on his ſcholar's belly, ſo that each of the ſufferers died; theſe were juſtly held to be murders, becauſe the correction being exceſſive, and ſuch as could not proceed but from a bad heart, it was equivalent to a deliberate act of ſlaughter. Neither ſhall he be guilty of a leſs crime who kills another in conſequence of ſuch a wilful act as ſhows him to be an enemy to all mankind in general; as going deliberately, and with an intent to do miſchief, upon a horſe uſed to ſtrike, or coolly diſcharging a gun among a multitude of people. So if a man reſolves to kill the next man he meets, and does kill him, it is murder, although he knew him not; for this is univerſal malice. And if two or more come together to do an unlawful act againſt the king's peace, of which the probable conſequence might be bloodſhed; as to beat a man, to commit a riot, or to rob a park, and one of them kills a man; it is murder in them all, becauſe of the unlawful act, the *malitia præcogitata*, or evil intended beforehand.

Alſo in many caſes where no malice is expreſſed, the law will imply it: as, where a man wilfully poiſons another, in ſuch a deliberate act the law preſumes malice, though no particular enmity can be proved. And if a man kills another ſuddenly, without any, or without a conſiderable provocation, the law implies malice; for no perſon, unleſs of an abandoned heart, would be guilty of ſuch an act upon a ſlight or no apparent cauſe. No affront, by words or geſtures only, is a ſufficient provocation, ſo as to excuſe or extenuate ſuch acts of violence as manifeſtly endanger the life of another. But if the perſon ſo provoked had unfortunately killed the other, by beating him in ſuch a manner as ſhowed only an intent to chaſtiſe and not to kill him, the law ſo far conſiders the provocation of contumelious behaviour, as to adjudge it only manſlaughter, and not murder. In like manner, if one kills an officer of juſtice, either civil or criminal, in the execution of his duty, or any of his aſſiſtants endeavouring to conſerve the peace, or any private perſon endeavouring to ſuppreſs an affray or apprehend a felon, knowing his authority or the intention with which he interpoſes, the law will imply malice, and the killer ſhall be guilty of murder. And if one intends to do another felony, and undeſignedly kills a man, this is alſo murder. Thus if one ſhoots at A and miſſes him, but kills B, this is murder; becauſe of the previous felonious intent, which the law transfers from one to the other. The ſame is the caſe, where one lays poiſon for A, and B, againſt whom the priſoner had no malicious intent, takes it, and it kills him, this is likewiſe murder. So alſo if one gives a woman with child a medicine to procure abortion, and it operates ſo violently as to kill the woman, this is murder in the perſon who gave it. It were endleſs to go through all the caſes of homicide, which have been adjudged, either expreſsly or impliedly, malicious; theſe therefore may ſuffice as a ſpecimen; and we may take it for a general rule, that all homicide is malicious, and of courſe amounts to murder, unleſs where juſtified by the command or permiſſion of the law; excuſed on a principle of accident or ſelf-preſervation; or alleviated into manſlaughter, by being either the involuntary conſequence of ſome act, not ſtrictly lawful, or (if voluntary) occaſioned by ſome ſudden and ſufficiently violent provocation. And all theſe circumſtances of juſtification, excuſe, or alleviation, it is incumbent upon the priſoner to make out, to the ſatisfaction of the court and jury: the latter of whom are to decide whether the circumſtances alleged are proved to have actually exiſted; the former, how far they extend to take away or mitigate the guilt. For all homicide is preſumed to be malicious, until the contrary appeareth upon evidence.

The puniſhment of murder, and that of man-ſlaughter, were formerly one and the ſame; both having the benefit of clergy: ſo that none but unlearned perſons, who leaſt knew the guilt of it, were put to death for this enormous crime. But now, by ſeveral ſtatutes, the benefit of clergy is taken away from murderers through malice prepenſe, their abettors, procurers, and counſellors. In atrocious caſes it was frequently uſual for the court to direct the murderer, after execution, to be hung upon a gibbet in chains near the place where the fact was committed; but this was no part of the legal judgment; and the like is ſtill ſometimes practiſed in the caſe of notorious thieves. This, being quite contrary to the expreſs command of the Moſaical law, ſeems to have been borrowed from the civil law; which, beſides the terror of the example, gives alſo another reaſon for this practice, viz. that it is a comfortable ſight to the relations and friends of the deceaſed. But now, in England, it is enacted by ſtatute 25 Geo. II. c. 37. that the judge, before whom any perſon is found guilty of wilful murder, ſhall pronounce ſentence immediately after conviction, unleſs he ſees cauſe to poſtpone it; and ſhall in paſſing ſentence direct him to be executed on the next day but one (unleſs the ſame ſhall be Sunday, and then on the Monday following), and that his body be delivered to the ſurgeons to be diſſected and anatomized; and that the judge may direct his body to be afterwards hung in chains, but in nowiſe to be buried without diſſection. And, during the ſhort but awful interval between ſentence and execution, the priſoner ſhall be kept alone, and ſuſtained with only bread and water. But a power is allowed to the judge, upon good and ſufficient cauſe, to reſpite the execution, and relax the other reſtraints of this act. See farther, Parricide, and *Petit Treaſon.*

Murderers, or *Murdering Pieces*, in a ſhip, are ſmall pieces of ordinance, either of braſs or iron, which have chambers put in at their breeches. They are uſed at the bulk-heads of the fore-caſtle, half-deck, or ſteerage, in order to clear the deck, on the ſhip's being boarded by an enemy.

MURENA. See Muræna.

MURENGERS, two officers of great antiquity in the city of Cheſter, annually choſen out of the aldermen, to ſee that the walls are kept in repair, and to receive a certain toll and cuſtom for the maintenance thereof.

MURET (Mark Anthony Francis), in Latin *Muretus*, was born at Muret, near Limoges, in 1526. He acquired a perfect knowledge of the Greek and Latin tongues without any inſtructor, and became one of the moſt learned men of his time. After having taught ſome time in Provence, he was made a profeſſor at Paris in the ſame college with Turnebus and Buchanan. In 1554 he went into Italy; and in 1563 was profeſſor of law, philoſophy, and hiſtory, at Rome, where he died in 1585. His principal works are, 1. Excellent notes on Terence, Horace, Catullus, Tacitus, Cicero, Salluſt, Ariſtotle, Xenophon, &c. 2. *Orationes.* 3. *Variæ Lectiones, Poemata, Hymni Sacri.* 4. *Diſputationes in Lib. I. Pandectorum, de Origine Juris, &c.* 5. *Epiſtolæ, Juvenilia Carmina, &c.* Moſt of Muret's works have been printed in the Venice edition of 1737, in 5 vols 8vo.

MUREX, in zoology, a genus of inſects belonging to the order of vermes teſtacea. This animal is of the ſnail-kind: the ſhell conſiſts of one ſpiral valve, rough, with membranaceous furrows; and the aperture terminates in an entire canal, either ſtraight, or ſomewhat aſcending. There are 60 ſpecies, particularly diſtinguiſhed by peculiarities in their ſhells, &c.

From a ſpecies of murex was obtained the famous Tyrian dye ſo much valued by the ancients. This, however, has long been ſuperſeded by the uſe of the cochineal. One of the ſhells producing the dye was a kind of buccinum; but the fineſt, or Tyrian purple, was got from the murex. Theſe ſpecies of ſhells are found in various parts of the Mediterranean. Immenſe heaps of them are to be ſeen about Tarentum to this day, evincing one place where this precious liquor was extracted. See Plate CCCXXII.

In the accounts of a Spaniſh philoſopher it is mentioned, that on the coaſts of Guayaquil and Gautimala in Peru the murex is alſo found. The ſhell which contains it adheres to the rocks that are waſhed by the ſea: it is of the ſize of a large walnut. The liquor may be extracted two ways; ſome kill the animal after they have drawn it out of the ſhell; then preſs it with a knife from head to tail; ſeparate from the body the part where the liquor is collected, and throw away the reſt. When this operation, after being repeated on ſeveral ſnails, has afforded a certain quantity of fluid, the thread intended to be dyed is dipped in it, and the proceſs is finiſhed. The colour, which is at firſt of the whiteneſs of milk, becomes afterwards green, and is not purple till the thread is dry. Thoſe who diſapprove of this method, draw the fiſh partly out of the ſhell, and, ſqueezing it, make it yield a fluid which ſerves for dying: they repeat this operation four times at different intervals, but always with leſs ſucceſs. If they continue it, the fiſh dies. No colour at preſent known, ſays the Abbé Raynal, can be compared to this, either as to luſtre, liveline ſs, or duration. It ſucceeds better on cotton than wool, linen, or ſilk.

Murex, a caltrap or iron inſtrument, with ſharp points projecting in every direction, uſed by the Romans as a defence againſt the enemy's horſe. It was ſo called, probably, becauſe the points bore ſome reſemblance to the ſpines and tubercles with which the ſhell of the fiſh murex is ſurrounded.

MURGI, or Murgis (anc. geog.), the laſt town of Bætica, next the Tarraconenſis: the Urce of Ptolemy. Now *Muxara*, a port-town of Granada, on the Mediterranean. W. Long 1° 50′. N. Lat. 37° 6′.

MURIA, alimentary ſalt. See Salt.

MURINA, or Murines, a delicious ſweet wine, medicated with ſpices, and the uſual drink of the ladies of antiquity.

MURILLO (Bartholomew-Stephen), a celebrated painter, was born at Pilas near Seville, in 1613. Having ſhown a very early inclination to painting, he was inſtructed by his uncle John del Caſtillo, an artiſt of ſome note, whoſe ſubjects were fairs and markets; in which ſtyle Murillo painted ſeveral pictures while he continued with that maſter; but his principal knowledge in the art was derived from Velaſquez, who directed his ſtudies, and frequently retouched his deſigns. Many writers aſſert, that he ſtudied at Rome, and improved himſelf exceſſively in that city. But Velaſco, a Spaniſh author, affirms that he never was in Italy; but arrived at the excellence he poſſeſſed by copying the works of Titian, Rubens, and Vandyck, which were at Madrid, and the Eſcurial; and alſo by ſtudying after the antique ſtatues, which are in the Royal collections. However, he became an excellent painter, and was employed by the king of Spain to execute ſeveral hiſtorical pictures, which raiſed his reputation through every province of his own country. Thoſe paintings being afterwards ſent to Rome as a preſent to the pope, the Italians were ſo much pleaſed with his performances, that they called him a ſecond Paul Veroneſe. In Spain he deſigned and finiſhed ſeveral grand altar-pieces, for the churches and convents at Madrid, Seville, Cordova, Cadiz, and Granada; and ſome of his compoſitions are in the churches of Flanders. But notwithſtanding his genius, taſte, and abilities, qualified him to execute ſubjects of hiſtory with general applauſe; yet his favourite ſubjects were beggar-boys, as large as life, in different actions and amuſements; which he uſually deſigned after nature, and gave them a ſtrong and good expreſſion. His original pictures of thoſe ſubjects have true merit, and are much eſteemed, many of them being admitted into the moſt capital collections of the Engliſh nobility; but of thoſe, there are abundance of copies, which, to the diſhonour of the artiſt, are ſold as originals to injudicious purchaſers. He died in 1685.

MURRAIN, or Gargle, a contagious diſeaſe among cattle. The ſymptoms are, a hanging down and ſwelling of the head, abundance of gum in the eyes, rattling in the throat, a ſhort breath, palpitation at the heart, ſtaggering, a hot breath, and a ſhining tongue. In order to prevent this diſeaſe, the cattle ſhould ſtand cool in ſummer, and have plenty of good water: all carrion ſhould be ſpeedily buried; and as the feeding of cattle in wet places, on rotten graſs and hay, often occaſions this diſeaſe, dry and ſweet fodder ſhould be given them.

MURRAY, a county of Scotland, extending by the coaſt from the river Spey on the eaſt to Beauly on the weſt, which is the boundary of the province of Roſs. It ſends two members to parliament, and is an earldom in a branch of the Stuart family.

According to the account of the reverend Mr Shaw miniſter of Elgin, in anſwer to ſome queries of Mr Pennant, the country produces wheat, barley, oats, rye, peaſe, and beans. Of theſe, in plentiful years, upwards of 20,000 bolls are exported, beſides ſerving the county itſelf and ſome of the Highland counties. Some hemp is alſo cultivated, and a great deal of flax; of which linen is made, not only for home-conſumption, but a conſiderable quantity of linen-yarn is exported. Great quantities of potatoes are alſo cultivated. Several hundreds of black cattle are alſo exported from the Highlands of Murray, but few or none from the Low lands.—Peculiar to this province is a kind of wood, called *red ſaugh*, or *ſallow*; which is no leſs beautiful than mohogany. It is much more firm and tough than mahogany, and reſembles the lighter-coloured kind of that wood. It receives a fine poliſh, but is very ſcarce, growing on rocks. But there are great foreſts of firs and birches, which our author thinks are the remains of the Sylva Caledonia. Here alſo is found a remarkable root, called by the natives *carmele*: it grows in heaths and birch-woods to the bigneſs of a large nut; and ſometimes there are four or five roots joined together by fibres. It has a green ſtalk and ſmall red flowers. Dido ſpeaking of the Caledonians, ſays, *Certum cibi genus parant ad omnia, quem ſi ceperint quantum eſt unius fabæ magnitudo, minime eſurire aut ſitire ſolent.* Cæſar alſo tells us of a root called *chara*, which his ſoldiers mixed with milk and made into bread when in want of proviſion, which greatly relieved them. This root, Mr Shaw thinks, is the ſame with the *carmele* or *ſweet root* of Murray. He informs us, that he hath often ſeen it dried, and kept for journeys through hills where no proviſion was to be had: he has likewiſe ſeen it pounded and infuſed; the liquor makes a more agreeable and wholeſome liquor than mead. It grows in ſuch plenty, that a cart-load of it can eaſily be gathered.

Murray is interſected by the rivers Spey, Loſſey, Findern, Nairn, Neſs, and Beauly. The river of Spey, riſing on the borders of Lochaber, is more than 60 Scots, or 100 Engliſh miles long, but too rapid to be navigable. Upon this river great floats of fir and birch-wood are carried down to the Frith; the float is guided by a man ſitting on a *courach*. This veſſel is of an oval ſhape, about four feet long and three feet broad; a ſmall keel from head to ſtern; a few ribs croſs the keel, and a ring of pliable wood round the lip of it; the whole covered with the rough hide of an ox or horſe. The rower ſits on a tranſverſe ſeat in the middle, and holds in his hand a rope, the end of which is tied to the float, and with the other hand he manages a paddle, keeps the float in deep water, and brings it to ſhore when he pleaſes. In this province alſo is Loch Neſs, remarkable for its never freezing. There are many other lakes in this country, of which one called *Dundelchack* is remarkable in that it is never covered with ice before the month of January; but after that time one night's ſtrong froſt covers it all over. On the eaſt ſide of Loch Neſs, a large mile above the loch, is the water-fall of Foher, where the river *Feach-len* falls over a ſteep rock about 80 feet high; and a thick fog riſes from the place where it falls, occaſioned by the violent daſhing of the water. There is a conſiderable ſalmon-fiſhery on the rivers Spey, Findorn, Neſs, and Beauly, which ſerves the towns and country, beſides exporting to the value of 12,000l. annually.

There are many natural caves in the hills of this country, which formerly were the receptacles of thieves and robbers and now afford ſhelter to hunters and ſhepherds in ſtormy weather. The moſt remarkable mountain is Carngern in Strathſpey. In it are found a particular kind of ſtones well known to the lapidaries. They are of blue, green, yellow, and amber colours; ſome ſo large as to make ſnuff-boxes, or ſmall cups; ſome of hexagonal or pentagonal figures, and tapering to a point at each end. The mountain of Benalar, in Badenoch, is by Mr Shaw reckoned to be the higheſt land in Scotland as waters flowing from it fall into the ſea at Dundee, Inverlochy, and Garmoch in Murray.

MURRHINE, MURRHINUS, Μοῤῥινος, in antiquity an appellation given to a delicate ſort of ware brought from the eaſt, whereof cups and vaſes were made, which added not a little to the ſplendour of the Roman banquets.

Critics are divided concerning the matter of the pocula, or vaſa murrhina, murrina, or murrea. Some will have them to have been the ſame with the Britiſh porcelain or china-ware.

The generality hold them to have been made of ſome precious kind of ſtone, which was found chiefly, as Pliny tells us, in Parthia, but more eſpecially in Carmania. Arrian tells, us that there was a great quantity of them made at Dioſpolis in Egypt. This he calls another ſort of murrhina work; and it is evident, from all accounts that the murrhina of Dioſpolis was a ſort of glaſs-ware made in imitation of the porcelain or murrha of India. There is ſome difference in the accounts given by Pliny and Martial of the murrhina vaſa. The firſt author ſays, that they would not bear hot liquors, but that only cold ones were drank out of them. The latter, on the other hand, tells us, that they bore hot liquors very well. If we credit Pliny's account, their porcelain was much inferior to the Britiſh in this particular. Some conjecture them to have been of agate, others of onyx, others of coral. Baronius, doubtleſs, was furtheſt out of the way, when he took them to be made of myrrh, congealed and hardened. Some have ſuppoſed theſe veſſels to be made of cryſtal; but this is contrary to the account of all the ancients. The Greeks had the words κρυςαλλος for cryſtal, and σμυρνη for myrrh, very common among them; and therefore, if theſe veſſels had been made of theſe ſubſtances, they would in ſome places have called them ſmyrna or cryſtalina. On the contrary, the moſt correct among them call them murrhina or morrina. The cups made of cryſtal; which were alſo in uſe at thoſe times, were called cryſtallina, and theſe murrhina or murrhæa, by way of keeping up the diſtinction; and Martial tells us, that the ſtone they were made of was ſpotted or variegated, calling them pocula maculoſæ murræ. And Statius mentions the cryſtalline and murrhine cups in the ſame ſentence, but as different things, not the ſame. Arrian mentions alſo the λιθος μορρια; which his interpreters cenſure as an error of the copies, and would alter into myrrha, the name of the gum myrrh.

Pompey is recorded as the firſt who brought theſe murrhine veſſels out of the eaſt, which he exhibited in his triumph, and dedicated to Jupiter Capitolinus. But private perſons were not long without them. So fond, in effect, did the Roman gentry grow of them, that a cup which held three ſextaries was ſold for 70 talents. T. Petronius, before his death, to ſpite Nero (or as Pliny expreſſes it, *ut menſam ejus exhæredaret*, to diſinherit his table), broke a baſon, *trulla murrhina*, valued at 300 talents, on which that emperor had ſet his heart.

MUS, in zoology: A genus of quadrupeds belonging to the order of *Glires;* the characters of which are theſe: The upper foreteeth are wedge-ſhaped; there are three grinders, ſometimes, (though rarely) only two, on each ſide of the jaws; and the clavicles or collar-bones are complete. In the new edition of the *Syſtema Naturæ*, by Dr Gmelin, the numerous ſpecies of this genus have been diſtributed into different groupes or diviſions, diſtinguiſhed by ſome particular character common to the individuals of each.—The firſt diviſion conſiſts of,

I. Myocastores, or *Beaver-rats*, the individuals of which have the tail *flattened* laterally at the end.

1. The coypus, or webbed beaver-rat, has a thick hairy tail of a moderate length, and the hind feet webbed. It is an inhabitant of Chili, where it frequents the water. It has a ſtrong reſemblance, both in colour and ſhape, to the otter; but is allied to the murine tribe by the number and arrangement of its teeth.

2. The zibethicus, or muſquaſh, with a long ſharp-pointed tail, and the feet not webbed. This has been already deſcribed under the article Castor, of which it was ranked as a ſpecies in the former editions of Linnæus. In fact, it does reſemble the beaver in the form of the body and flat ſcaly tail, as well as in its manners and economy. In ſize, however, and length of tail, it comes nearer to the brown rat; but in its general appearance, and in the ſhort hairy ears, it reſembles the water-rat.

II. Mures, or *Rats* and *Mice;* having *round* tails, ſome naked and ſome hairy.

1. The piloris, or muſk cavy, with a naked tail blunt at the end, and covered with ſcales. There are two varieties: one with the body of an uniform whitiſh colour; the other with the upper parts tawny, and the under parts white. The former inhabits Ceylon, and the latter the Weſt Indies. They are nearly of the ſize of a rabbit: they both burrow in the ground; ſometimes infeſt houſes like the rat; and have a ſtrong flavour of muſk.

Plate CCCXIX. fig. 20.

2. The caraco has a naked tail, long, ſcaly, and ſomewhat blunt; the body is of a brown grey colour, and the hind feet are very ſlightly webbed. It inhabits the eaſtern parts of Siberia, and probably Chineſe Tartary and the northern provinces of China; burrowing like the rabbit, near the banks of rivers.—It ſwims remarkably well, and even infeſts houſes.—The body and head are ſix inches in length, and the tail four and a half.

3. The americanus, or American rat, has a long naked, and ſcaly tail; the head is long-ſhaped with a narrow pointed noſe, the upper jaw being much longer than the lower; the ears are large and naked. It is larger than the black, and ſmaller than the brown rat; its colour is of a deep brown, inclining to aſh on the belly, and the fur is courſe and harſh. It is probably this ſpecies which is ſaid (Kalm's Trav. ii. 48,) to live among the ſtones and clefts of rocks, in the blue mountains of Virginia, at a diſtance from the peopled part of the country, which comes out only at night, and makes a terrible noiſe.

Plate CCCXVII. fig. 5.

4. The decumanus, or brown rat, has a long, naked, ſcaly tail; the upper parts of the body are of a light brown, mixed with a tawny and aſh colour, the lower parts dirty white. The head and body meaſure about nine inches; and the length of the tail, which conſiſts of 200 rings, is ſeven and a half. The whiſkers are larger than the head; and the eyes are large, black, and prominent. The fore-feet have four toes, with a ſmall claw in place of the fifth or thumb. It inhabits India and Perſia, and has only been known in Europe in the preſent century. They dwell in burrows which they dig in the banks of rivers; and frequent towns, aqueducts, drains, neceſſaries, ſtables, barns, gardens, fields, and houſes. They ſwim and dive with great dexterity; feed on vegetables, grain, fruits, and even deſtroy poultry; and are hunted eagerly by cats, dogs, and ferrets. They lay up ſtores of acorns, beech-maſt, and other proviſions in their holes; in which the males remain during winter, except in fine weather, without hybernating; but the females and their young live moſtly in barns and outhouſes in that ſeaſon. They often emigrate from one place to another in great companies. The female produces three times in the year, having 12 or 15, even 18 or 19, at a litter. The bite of this creature is not only ſevere but dangerous, the wound being immediately attended with great ſwelling, and is a long time in healing. Theſe animals are ſo bold as to turn upon thoſe who purſue them, and faſten on the ſtick or hand of ſuch as offer to ſtrike them. This ſpecies is ſuppoſed to be the mus caſpicus of Ælian †, which he ſays was nearly as large as the ichneumon and made periodical viſits in vaſt multitudes to the countries which border on the Caſpian, ſwimming boldly over the rivers, holding by each others tails.

† Hiſt. c. 17.

Fig. 11.

5. The rattus, black or common rat, has an almoſt naked ſcaly tail, which is very ſmall, has 250 diſtinct rings, and is eight inches long. The head and body meaſure ſeven inches in length: the upper parts are a deep black grey, and the under parts aſh-coloured. There are four toes, and a ſmall claw in place of the fifth, on each fore foot, and five on the hind feet. This ſpecies inhabits India, Perſia, and Europe except its moſt northern parts; from hence it has been carried

to Africa and America; and is frequent in Otaheite, though leſs common in the other iſlands of the ſouthern ocean. Of late years it has greatly diminiſhed in Europe, and is even in many places extirpated, in conſequence of the introduction of the brown ſpecies, which deſtroys the black rats; though little is gained by the exchange, the brown having the ſame diſpoſitions, with greater ſtrength and abilities for doing miſchief. It is the moſt pernicious of any of our ſmaller quadrupeds. Meat, corn, paper, clothes, furniture, in ſhort every convenience of life is a prey to this deſtructive creature. Nor are its devaſtations confined to theſe; for it will make equal havock among poultry, rabbits, or young game; nay, it has been known to gnaw the extremities of infants when aſleep. It is a domeſtic animal, reſiding very frequently in houſes, barns, or granaries and it is furniſhed with fore teeth of ſuch ſtrength as enable it to force its way through the hardeſt wood or the oldeſt mortar. It makes a lodge either for its days reſidence or a neſt for its young near a chimney; and improves the warmth of it, by forming there a magazine of wool, bits of cloth, hay, or ſtraw. It lodges alſo in cielings, and in the void ſpaces between the wall and the wainſcotting. From theſe lurking-places the rats iſſue in queſt of food, and tranſport thither every ſubſtance they can drag, forming conſiderable magazines eſpecially when they have young to provide for. The female has ten teats, and brings forth ſeveral times in a year, but always in the ſummer ſeaſon. The litter generally conſiſts of five or ſix; and in ſpite of poiſon, traps, and cats, they thus multiply in ſuch a degree as ſometimes to do a great deal of damage. In old country-houſes where grain is kept and where the vicinity of barns and magazines facilitates their retreats, they often increaſe ſo prodigiouſly, that the poſſeſſors are obliged to remove and deſert their habitations, unleſs the rats happen to deſtroy each other; an event which frequently takes place, for theſe creatures when pinched for food devour each other. When a famine happens by reaſon of too many being crowded into one place, the ſtrong kill the weak, open their heads, and firſt eat the brain and then the reſt of the body. Next day the war is renewed, and continues in the ſame manner till the moſt of them are deſtroyed; which is the reaſon why theſe animals, after being extremely troubleſome for ſome time, diſappear all at once and do not return for a long time. Rats are extremely laſcivious: they ſqueak during their amours, and cry when they fight. They ſoon learn their young to eat; and when they begin to iſſue from the hole, their mother watches, defends, and even fights with the cats in order to ſave them. A large rat is more miſchievous than a young cat, and nearly as ſtrong: the rat uſes her fore-teeth; and the cat makes moſt uſe of her claws; ſo that the latter requires both to be vigorous, and accuſtomed to fight, in order to deſtroy her adverſary. The weaſel, though ſmaller, is a much more dangerous and formidable enemy to the rat, becauſe he can follow it into its retreat. Their ſtrength being nearly equal, the combat often continues for a long time, but the method of uſing their arms is very different. The rat wounds only by reiterated ſtrokes with his fore-teeth, which are better formed for gnawing than biting; and being ſituated at the extremity of the lever or jaw, they have not much force. But the weaſel bites cruelly with the whole jaw; and inſtead of letting go its hold, ſucks the blood from the wounded part, ſo that the rat is always killed.—The rat was firſt introduced into America by the Europeans in 1544, and is now the peſt of all that continent. In the neighbourhood of the lower parts of the river Volga, there is a ſmall variety of this ſpecies found in the deſerts, which does not weigh above ſix or ſeven drams.

6. The muſculus, or common mouſe, has a very long, ſcaly, and almoſt naked tail; the fore feet have each four toes; the hind feet five, the fifth or thumb having no claw; the hand and body meaſure three inches and a half in length; the upper parts are tawny, and the lower parts whitiſh or aſh-coloured. This little animal, which inhabits all parts of the world, lives almoſt entirely in houſes, and follows mankind for the ſake of their proviſions. It feeds on almoſt every thing, ſuch as grain, bread, cheeſe, butter, oil, and every kind of food uſed by mankind, and drinks little; it is of mild and gentle manners, exceedingly timid, and very quick in all its motions. The mouſe never iſſues from his hole but in queſt of food, and runs in again upon the leaſt alarm. It goes not, like the rat, from houſe to houſe, unleſs forced, and is not near ſo deſtructive. It is capable alſo of being tamed to a certain degree, though not ſo perfectly as other animals. It has many enemies, from whom it can eſcape only by its agility and minuteneſs. Owls, birds of prey, cats, weaſels, hedge-hogs, and even rats make war upon the mice, ſo that they are deſtroyed by millions; yet the ſpecies ſtill ſubſiſts by its amazing fecundity. They bring forth at all ſeaſons, and ſeveral times in the year; the litter generally conſiſts of five or ſix; and in leſs than 15 days the young diſperſe, and are able to provide for themſelves. Ariſtotle tells us, that having ſhut up a pregnant mouſe in a veſſel, along with plenty of grain, he found in a ſhort time after 120 mice, all ſprung from the ſame mother. Plate CCCXVIII fig. 2.

Several varieties of mice as to colour are found, ſome being altogether black, ſome yellowiſh, ſome ſpotted with white, ſome of a white colour with aſh-coloured ſpots, and the moſt beautiful of all, and the leaſt common, are entirely white, with red eyes; but as theſe agree in every other circumſtance, it is unneceſſary to deſcribe them more at large.

7. The ſylvaticus, or long-tailed field-mouſe, is larger than the common mouſe, meaſuring from the end of the noſe to the ſetting on of the tail four inches and an half, the tail four inches; the upper parts of the body are of a yellowiſh brown; the breaſt is yellow, and the belly white: the tail is covered with ſhort hair. The fore feet have four toes each: the hind feet five. Theſe animals are found in fields, gardens, and ſhrubberies. In ſome places they are called *bean-mice*, from the havock they make among beans when firſt ſown. They feed alſo on nuts, acorns and grain, of which they amaſs quantities, not proportioned to their wants, but to the capacity of the place where it is depoſited, inſomuch that a ſingle animal will collect more than a buſhel. Thus they provide for other animals as well as themſelves; the hog comes in for a ſhare, and the great damage done Fig. 6.

to the fields by theſe creatures, in rooting up the ground, is chiefly owing to their ſearch after the concealed hoards of the field-mice. M. Buffon informs us, that he has often ſeen great damage done to the plantations by the field mice. They carry off the new ſown acorns; by following the furrow of the plough, they dig up one after another, not leaving a ſingle ſeed. This happens chiefly in thoſe ſeaſons when the acorns are ſcarce; not finding a ſufficient quantity in the woods, they come in queſt of them in the cultivated fields, and often carry off ſuch quantities that they corrrupt in their magazines. Theſe creatures according to the ſame author, do more miſchief in a nurſery of trees than all the birds and other animals put together. The only way to prevent this damage is to lay traps at ten paces aſunder, through the extent of the ſown field. No other apparatus is neceſſary than a roaſted wall-nut placed under a flat ſtone, ſupported by a ſtick. The animals come to eat the wal-nut which they preſer to acorns; and as it is fixed to the ſtick, whenever they touch it, the ſtone falls down and cruſhes them to death. The ſame expedient M. Buffon alſo made uſe of with ſucceſs againſt the ſhort-tailed field-mouſe, which alſo deſtroys acorns. In this way he found that upwards of 100 were taken each day, from a piece of ground conſiſting only of about 40 French appents. From the 15th of November to the 4th of December, above 2000 were caught in this manner. Their numbers gradually diminiſhed till the froſt became ſevere, which is the time they retire into their holes to feed on their magazines. In autumn they are moſt numerous; for if proviſions fail during the winter they devour one another. The long-tailed mice eat alſo the ſhort tailed ſpecies, and even thruſhes, blackbirds, &c. which they find entangled in ſnares. They firſt eat the brain, and then the reſt of the body, M. Buffon once kept a dozen of theſe mice in a cage, and furniſhed them with food every morning at eight o'clock. One day they were neglected for about a quarter of an hour, when one of their number was eaten up by the reſt; next day another ſuffered the ſame fate; and in a few days only one remained; all the others had been killed, and partly devoured; and even the ſurviver himſelf had his feet and tail mutilated. Theſe animals are very prolific, producing more than once a-year, and bring nine or ten at a birth. They generally make the neſt for their young very near the ſurface and often in a thick tuft of graſs. During winter they frequent barns, ſtables, and outhouſes.

8. The meſſorius, harveſt mouſe, or leſs long tailed field mouſe, is a very ſmall ſpecies, or perhaps rather a variety of the former; and inhabits Hampſhire, where it is very numerous, particularly during harveſt. They form their neſt above the ground, between the ſtraws of the ſtanding corn, and ſometimes in thiſtles; it is of a round ſhape, and compoſed of the blades of corn. They bring about eight young ones at a time. Theſe never enter houſes; but are often carried, in the ſheaves of corn, into ricks; and 100 of them have frequently been found in a ſingle rick on pulling it down to be houſed. Thoſe that are not thus carried away in the ſheaves, ſhelter themſelves during winter under ground and burrow deep, forming a warm bed for themſelves of dead graſs. They are the ſmalleſt of the Britiſh quadrupeds; the length from noſe to tail is only two inches and a half; the tail two inches, and the weight one ſixth of an ounce. They are more ſlender than the other long-tailed field-mouſe; and their back of a fuller red, inclining to the colour of a dormouſe.

9. The agrarius, or ruſtic mouſe, is about three inches long, and ſcarcely weighs half an ounce; the tail is only about half the length of the body and head; the upper part of the body is of a yellowiſh colour, with a dark line along the back; the belly and the legs are white; the head is oblong, with a ſharp noſe, and ſmall ears lined with fur; the hind legs have each a duſky circle juſt above the foot. It inhabits Ruſſia, and is found in Sileſia, rarely in Germany. This ſpecies is migratory: and wanders about often in vaſt multitudes, doing immenſe injury to the corn: It burrows in the ground, forming a long gallery juſt below the ſurface, and a little elevated, leading to a larger chamber, in which conſiderable quantities of grain and ſeeds are ſtored up for winter proviſion. Plate CCCXIX, fig. 2.

10. The minutus, or minute mouſe, has the upper parts of the body of a deep tawny or ferruginous colour, and the under parts whitiſh. It is about half the ſize of the common mouſe, the tail being ſcarcely two inches long, the female is ſmaller than the male, and leſs elegant in her colours; the noſe is ſomewhat ſharp; the face is duſky, with ſome whiteneſs at the corners of the mouth; the ears are ſmall, and almoſt laid in the fur; the feet are grey. This ſpecies inhabits Ruſſia; where it is found in the corn-fields and in barns, and is plentiful in birch-woods: it ſeems to wander about without any fixed places for its neſt; and much greater numbers of males are found than of females, Fig. 1.

11. The vagus, or wandering mouſe, is between two and three inches long; the colour of the upper parts of the body is a pale aſh, waved with black, and having a black line along the middle of the back; the ears are large, oval, naked, and plaited. The legs are very ſlender, and the whitiſh, having ſome toes and a conical excreſcence before; and five behind. all armed with long claws: the tail is longer than the body, very ſlender, prehenſile at the end, of an aſh colour above and whitiſh below; the head is oblong with a blunt noſe reddiſh at the tip, having yellow fore-teeth, and only two grinders on each ſide in the upper-jaw. The female has eight teats.—This ſpecies inhabits the deſerts of Tartary and Siberia, as high as the Ural, Irtiſh, Oby, and Jeniſei. Is frequent in the birch woods, and lives in fiſſures of rocks, under ſtones, and in hollows of trees; feeding chiefly on ſeeds, and likewiſe on ſmall animals of the ſame genus. It wanders about in great flocks, migrating from one place to another in the night; hybernates during winter, and is of a very chilly nature, ſo as even to become torpid and fall aſleep, in a round form in the cold nights of the month of June. It has carnivorous inclinations. Fig. 5.

12. The betulinus or beech-mouſe has a conſiderable reſemblance to the wandering mouſe, but is ſomewhat ſmaller. The upper parts of the body are tawny, with a black line along the back, the under parts whitiſh or pale aſh-colour, the noſe is ſharp, Fig. 15.

with a red tip; the ears are fmall, oval, plaited, brown, and briftly at the ends; the limbs are very flender, with long and very feparable toes; the tail is flender and much longer than the body. This fpecies inhabits the birch woods in the defart plains of Ifchim and Baraba, and between the Oby and Jenifei. It lives folitary, frequenting the hollows of decayed trees. It runs up trees readily, and faftens on their branches with its tail; and by means of its flender fingers or toes, it can faften even to a very fmooth furface. It is a very tender animal, foon growing torpid in cold weather; and its voice is very weak.

Plate cccxviii fig. 15.

13. The pumilio, or dwarf-moufe, is of a brownifh afh colour, with the fore-head and nape of the neck black, and having four black lines along the back meeting at the tail. It is fcarcely two inches long, the tail is about two-thirds of the length of the body, and the whole animal, even when fteeped many months in fpirits, hardly weighs four fcruples. The body is fomewhat flattened; the regions of the eyes, the ears, and the nofe, are of a paler colour than the reft of the body; all the feet have five toes, the thumb or inner toe of the fore feet being very fmall, but diftinctly furnifhed with a claw; the legs and feet are ftrongly made; the tail is almoft naked, and of a pale afh-colour. This fpecies, which was firft defcribed by Dr Sparrman, inhabits the forefts of Sitficamma near Ilangen river, 200 hours journey from the Cape of Good Hope.

Plate cccxix. fig. 16.

14. The faxatilis, or rock moufe, is about four inches long, and weighs nearly nine drams; the tail is hairy, an inch and a half in length, of a brown colour above, and white beneath; the head is oblong, with a longifh nofe, and oval downy ears, brown at the edges; the limbs are ftrong; and the tail is thinly covered with hair; the upper parts of the body are of a brown colour, flightly mixed with yellowifh or grey; the fides are rather inclined to the latter colour; the belly is of a light afh or whitifh; the feet and legs are blackifh; the fnout is dufky, and furrounded with a flender white ring. This fpecies is an inhabitant of the eaftern parts of Siberia beyond lake Baikal, and of the deferts of Mongul Tartary.—It burrows in the fiffures of rocks, forming a winding oblique paffage, which afterwards branches out into feveral others pointing downwards, and ending in a chamber, in which is a bed or neft of foft herbs. It feeds chiefly on the feeds of the aftragalus.

Plate cccxviii fig. 17.

15. The amphibious, or water-rat, with a long tail; the upper parts of the body being covered with black hair mixed with yellowifh, and the under parts afh-coloured; the ears fcarcely appear above the fur; the feet have three toes on each, and the rudiments of a fourth. This fpecies of which there are feveral varieties, differing in the toes and in the colour, inhabits the whole of Europe, the northern parts of Afia as far as the icy fea, and North America.—They dwell chiefly near waters, forming burrows in their fteep banks about ponds and wet ditches; likewife in marfhy places, meadows, and gardens: feeding on roots, herbs, and fhrubs; and on frogs, crawfifh, infects, fmall fifh, and the fry of larger ones. They fwim and dive with great facility, and live much in the water. They are very fierce, and bite bitterly. The flefh of thefe animals is reckoned very delicate by fome of the more favage inhabitants of the Ruffian empire; and is eaten by the French along with that of the otter during lent. The female is fmaller than the male, and has a greater yellownefs of colour; fhe has eight teats, four of which are placed on the breaft and four on the belly. They procreate about the end of winter, at which time they fmell ftrongly of mufk; and produce as far as eight young ones in the month of April.

Plate cccxix fig. 2.

16. The alliarius, or garlic moufe, has a fhort tail; the ears rather large, and fomewhat hairy; the body afh coloured on its upper parts, and whitifh underneath. The head and body meafure fomewhat more than four inches, the tail fcarcely an inch and a half. This fpecies inhabits Siberia, about the rivers Jenifei, Kan, Lena, and Angara; and feeds on the roots of garlic, of which it lays up large ftores in fubterraneous burrows.

Fig. 3.

17. The rutilus, or red moufe, has a fhort tail: the ears are longer than the fur, which is tawny red on the back, light grey and yellow on the fides, and whitifh on the belly. The head and body meafures about four inches, and the tail one.—This fpecies inhabits Siberia, from the Oby as far as Kamtfchatka, and within the Arctic circle. It lives in holes and in hollows of trees; feeding on grain, and fometimes on animals of the fame genus. It comes often into houfes and barns, eating almoft of every thing which comes in its way, but is particularly fond of flefh. It is very lively, and runs about even on the fnow the whole winter.

Plate cccxviii fig. [illegible]

18. The arvalis, or meadow-moufe, is from three to fix inches long, the female being much longer than the male, and the tail is little more than an inch: the head is large, with a blunt nofe, fhort ears almoft hid in the fur, and prominent eyes; the upper parts of the body are of a mixed ferruginous and black colour; the belly is deep afh, and the legs and feet dufky;—the tail is terminated by a fmall tuft of hair. There is a variety which is almoft black.—This fpecies inhabits all Europe, Siberia, Hircania, and Newfoundland; dwelling in bufhy places, corn-fields, meadows, and gardens, chiefly near waters; living on grain, nuts, acorns, and walnuts, which it collects in its fubterraneous burrows: but it appears to prefer corn to every other food. When the grain is ripe, they affemble from all quarters, and often do great damage by cutting the ftalks of corn in order to come at the ears. They follow the reapers, and pick up all the fallen and neglected grain. When they have confumed this, they flock to the new-fown fields, and deftroy the crop of the enfuing year. In winter moft of them retire to the woods, where they feed on beech-mafts, acorns, and the feeds of trees. In particular years they appear in numbers fo immenfe, that they would deftroy every thing if they continued long: but they die fuddenly, and eat one another during a fcarcity of provifions. They befides are devoured by the long-tailed field-mice, by foxes, wild cats, and weafels. Thefe creatures are often carried home in the fheaves of corn, and 100 of them have been found in one fingle rick. In fuch cafes it has been obferved, that the dogs have devoured all the mice of this fort they could find, rejecting the common kind; and, on the contrary, the cats would touch none but the laft. The female produces

ſeveral times a year, and brings from eight to twelve young at a birth: it has a ſtrong affection for them; one that was ſeduced into a wire trap by placing its brood in it, was ſo intent on foſtering them, that it appeared quite regardleſs of its captivity. In Newfoundland, theſe mice are very deſtructive to gardens; but ſeldom do much damage in this way in Britain.

Plate cccxix. fig. 13. 19. The ſocialis, or ſocial mouſe, with a very ſhort ſlender tail, and naked, rounded, and very ſhort ears; the fore feet have each three toes and the rudiments of a fourth; the upper parts of the body are light grey; the ſides, ſhoulders, and belly, are white. The head and body are ſomewhat more than three inches long, the tail half an inch. This ſpecies inhabits the ſandy deſerts between the Volga and Ural, near the Caſpian ſea, and in the mountains of Hircania.—They live in pairs, or in families, conſiſting of a male and a female with their young ones; and of theſe families vaſt numbers live together, the whole country being covered with little hills of earth thrown out of their burrows. They feed moſtly on tulip roots; and are preyed on by weaſels, polecats, crows, and otters. They ſwarm chiefly in ſprings, and rarely appear in autumn, at which ſeaſon it is ſuppoſed they migrate, or take ſhelter among the buſhes.

Fig. 12. 20. The œconomous, or economic mouſe, in its general form, reſembles the meadow-mouſe; but the body is rather longer and the belly larger. The ears are naked and hid in the fur; the colour is tawny; and the fore feet have each three toes with the rudiments of a fourth. The head and body meaſure four inches and a quarter, the tail ſomewhat more than an inch. This ſpecies inhabits Siberia, from the river Irtiſh eaſtwards, in Kamtſchatka, and under the Arctic circle. They are called by Dr Pallas *mures œconomi*, from their curious way of living. They dwell moſtly in damp ſoils, forming burrows, with many chambers and numerous entrances, immediately under the turf. In theſe they lay up magazines of various vegetable food, chiefly bulbous roots; which they ſpread out in ſunny days to dry, and never touch them but in winter, living all ſummer on berries and other vegetables. The Kamtſchatkans hold theſe animals in great regard, and never deſtroy their hoards; they take away only part, and leave ſome caviare or other ſubſtance to ſupport them in its ſtead. This ſpecies ſometimes emigrates in vaſt multitudes, keeping a ſtraight courſe, like the lemmus, even over rivers; and are much infeſted on their march by birds, fiſh, wild hogs, foxes, and other wild beaſts. They begin their March from about the river Pengin in ſpring, and about the middle of July reach Ochotſk and Judoma, at a vaſt diſtance; and return in October. The Kamtſchatkans are much alarmed at their migrations which portend rainy weather and a bad chace; and when they find them lying weak and ſpent with fatigue after croſſing a river, give them every aſſiſtance in their power. The Tunguſi are not ſo much attached to this animal, and make uſe [illegible] winter ſtores [illegible] theſe [illegible] as food.

21. The gregalis, or gregarious mouſe, has a ſhort tail; the ears are longer than the fur; the fore-feet have each three toes and the rudiments of a fourth; the fur is dark aſh-coloured on the upper parts, and whitiſh below. This ſpecies is leſs than the economic mouſe, and longer than the ſocial; the female being five inches long and the male four. It inhabits the eaſtern parts of Siberia, where it dwells in arid places, forming burrows with numerous openings directly under the ſod; theſe lead to chambers in which it lays up large ſtores of roots eſpecially thoſe of the lilium pomponii and garlic: It eats ſitting up.

22. The laniger, or woolly mouſe, with woolly fur of an aſh-colour, inhabits Peru and the northern parts of Chili. It burrows in the earth, is very docile and cleanly, and is eaſily tamed; it lives on bulbous roots, eſpecially onions; the female breeds twice a-year, and brings five or ſix young ones at each litter. It is about ſix inches long, with a ſhort noſe, and ſmall ſharp pointed ears; the fur is very long and exceedingly fine, almoſt like the threads of a ſpider's web, and was formerly employed as the very fineſt ſpecies of wool by the Peruvians.

Fig. 1[illegible] 23. The lagurus, or rambling mouſe, has hardly any tail; the ears are ſhorter than the fur; the fore-feet have each three toes, and the rudiments of a fourth; the upper parts of the body are aſh coloured mixed with duſky, and having a black line along the back. The head is long, with rough and ſwelling lips; the limbs are ſhort and ſlender; and the length of the body and head is between three and four inches. This ſpecies inhabits the deſarts near the rivers Ural, Irtiſh, and Jeniſei.—Each individual forms a round neſt of dried graſs in a burrow, having an oblique and a perpendicular entrance. They feed chiefly on the dwarf iris; but eat all kinds of grain, and devour other ſpecies of this genus, as well as one another. They ſleep very much, in a rolled-up form, and are very ſlow in their motions, like the marmot; but do not become torpid in winter. This ſpecies is very ſalacious; the males fight together for the females, and the conqueror generally devours the vanquiſhed. The female ſmells of muſk when in ſeaſon, produces ſeveral times in the year, and brings five or ſix young ones at a birth. They migrate in great troops; whence the name of rambling mice, which is given them by the Tartars.

Fig. 4. 24. The torquatus, collared or ringed mouſe, has a very ſhort tail, with a tuft of hard briſtles at the end, which is blunt: the ears are ſhorter than the fur; the feet have each five toes; the fur is ferruginous, varied with grey, yellow, and duſky, having a whitiſh collar round the neck, and a dark line along the back. The head and body are ſomewhat more than three inches long, the tail ſcarcely one inch. It inhabits the northern parts of the Uralian mountains, and the marſhes near the frozen ocean; feeding chiefly on the lichen rangiferinus, lichen nivalis, and polygonus viviparus: theſe articles of food are ſtored up in burrows, having numerous paſſages, which it digs under the turfy ſoil. This ſpecies is migratory, and reſembles the lemmus in its manners.

Plate cccxx. fig. 2. 25. The lemmus, or lemming, has a very ſhort tail: The head is pointed, having very long whiſkers, ſix of the hairs on each ſide being longer and ſtronger than the reſt; the mouth is ſmall, having two very long fore-teeth in each jaw, and the upper lip is divided; the eyes are ſmall and black; the ears are ſhorter than the fur, rounded, and reclined backwards; the fore-legs are very ſhort, having four ſlender hairy toes

toes on each, and a long ſharp claw like a cock's ſpur in place of the fifth or thumb; the hind-feet have five toes; the ſkin is very thin, and the upper parts of the body are black and tawny, diſpoſed in irregular blotches; the belly is white tinged with yellow. The length from noſe to tail is about five inches; of the tail, half an inch. This ſingular animal inhabits the mountains of Norway and Lapland. They feed on graſs, the catkins of the dwarf birch, the lichen rangiferinus, or rein-deer liver wort, and other ſuch vegetable productions; in ſummer they form ſhallow burrows under the turf, and in winter they make ſimilar long paſſages under the ſnow in queſt of food; for as they do not lay up magazines, and do not hybernate, they are obliged to ſearch for proviſions in the rigorous winter of theſe northen climates. When they foreſee, by ſome wonderful inſtinct of nature, the approach of a very ſevere winter, they leave their northern haunts in autumn, and emigrate in immenſe multitudes into the lower parts of Norway and Sweden, keeping a ſtraight line in ſpite of every obſtacle, moving moſtly in the night-time, and making prodigious havoc of every vegetable they are able to reach. In this journey, which takes place at uncertain intervals, though generally about every ten years, they are deſtroyed by eagles, hawks, foxes, and other animals of prey, and numbers are drowned in paſſing rivers or lakes, which never interrupt their courſe, even proceeding on into the ſea: from all theſe concurring cauſes very few live to return to their native mountains, and thus a check is put to to their ravages, as it takes years to repair their numbers ſufficiently for another invaſion. They are bold and fierce, ſo as even to attack men and animals, if they meet them in their courſe; and bite ſo hard as to allow themſelves to be carried a conſiderable way, hanging by their teeth to a ſtick, before they will quit their hold. The female breeds ſeveral times in the year, producing five or ſix young at a birth: ſometimes they bring forth during their migration, when they carry their young in their mouth or on their back.

There is a variety, the Sibiricus, or Siberian lemming, of a ſmaller ſize, and more uniform tawny colour, than the above. It inhabits the northern parts of the Uralian chain of mountains, and on the river Oby. It differs greatly in manners from the former: for it lays up in its burrows large ſtores of proviſions to ſerve during winter; whence it is probable that it does not migrate like the Norwegian kind.

There are nine or ten other ſpecies belonging to this diviſion.

III. Criceti, or *Hamſters*; having pouches on the cheeks, and ſhort hairy tails.

Plate cccxix. fig. 10.

1. The acredula, or Siberian hamſter, has large oblong oval furred ears; the upper parts of the body are of a yellowiſh and brown aſh-colour, the under parts hoary. The head and body meaſure four inches, and the tail near one. This ſpecies inhabits the diſtrict of Orenburgh in Siberia, near the Yaik or Ural. It lives in burrows, which it quits only in the night to ſearch for food: The Coſſacks ſay that it migrates out of the deſerts in vaſt multitudes; but Dr Pallas ſuſpects this to be a miſtake.

Plate cccxviii. fig. 1.

2. The M. cricetus Germanicus, or German hamſter, is the moſt deſtructive of the whole rat-tribe. The males are about ten inches long, and the tail about three, but the females are ſcarcely more than half ſo large; the former weigh from 12 to 16 ounces: while the latter ſeldom exceed from four to ſix ounces; The head is thick, with a blunt noſe, and numerous whiſkers, large full black eyes, and large rounded open ears; uſually the head and back are of a reddiſh brown colour, with red cheeks; the ſides are paler, with three white ſpots; the breaſt, upper part of the fore-legs and belly, are black; the feet are large and white, having four toes, and a claw inſtead of a fifth toe on the fore-feet, and five toes on each hind foot: The colour varies; ſometimes though rarely, they are found entirely white or yellowiſh, or white with black ſpots on the back; ſometimes the ſnout is white, and the forehead aſh coloured, or the lower jaw of a white colour. Fig. 4. There is a variety (the black German hamſter) which is entirely black, excepting the tip of the noſe, edges of the ears, and the feet, which are white. This ſpecies inhabits Siberia, the ſouth of Ruſſia, Poland, Sclavonia, Hungary, Sileſia, Bohemia, and Germany beyond the Rhine, eſpecially in Thuringia.—Each individual forms a ſubteraneous burrow, conſiſting of ſeveral chambers, with two holes or entrances leading from the ſurface; one of theſe is perpendicular and the other, in which the excrements are lodged, is oblique; the holes of the females have ſeveral perpendicular openings, and each young one of her family is lodged in a ſeparate chamber: The chambers which are ſet apart for the lodging of themſelves and young are lined with ſtraw or graſs; the reſt are larger, and are appropriated for containing magazines of grain, beans, peaſe, lintſeed, vetches, and other ſuch ſeeds, each in a ſeparate cell. The chambers of the older animals are dug ſeveral feet deep, while thoſe of the younger ones ſeldom exceed a foot under the ſurface. The hamſter ſleeps during the winter like the marmots; when in a torpid ſtate, neither reſpiration nor any kind of feeling can be perceived. The heart, however, beats 15 times in a minute, which has been diſcovered by opening the cheſt. The blood continues to be fluid, but the inteſtines are not irritable; even an electrical ſhock does not awake him; but in the open air he never becomes torpid. When dug up in his ſtate of torpidity, the hamſter is found with his head bent under his belly between the two fore-legs, and thoſe behind reſt upon his muzzle. The eyes are ſhut; and when the eye-lids are forced open, they inſtantly cloſe again, The members are ſtiff, like thoſe of a dead animal, and the whole body feels as cold as ice. When diſſected during this ſtate, he ſeems to feel very little; ſometimes indeed he opens his mouth as if he wanted to reſpire; but his lethargy is too ſtrong to admit of his awakening entirely. This lethargy hath been abſcribed ſolely to a certain degree of cold; which indeed may be true with regard to dormice, bats, &c. But experience ſhows, that, in order to render the hamſter torpid, he muſt alſo be excluded from all communication with the external air; for when he is ſhut up in a cage filled with earth and ſtraw, and expoſed in winter to a degree of cold ſufficient to freeze the water, he never becomes torpid: but when the cage is ſunk four or five feet under ground, and well ſecured againſt the acceſs of the air, at the end of eight or ten days he is equally torpid

as if he had been in his own burrow. If the cage is brought up to the ſurface, the hamſter will awake in a few hours, and reſume its torpid ſtate when put below the earth. The experiment may be repeated with the ſame ſucceſs as long as the froſt continues. We have a farther proof that the abſence of the air is one of the cauſes of torpidity in the hamſter: for when brought up from his hole in the coldeſt weather, and expoſed to the air, he infallibly awakes in a few hours. This experiment ſucceeds as well in the night as in the day; which ſhows that light has no ſhare in producing the effect. It is curious to obſerve the hamſter paſſing from a torpid to an active ſtate. He firſt loſes the rigidity of his members, and then makes a profound reſpiration, but at long intervals. His legs begin to move, he opens his mouth and utters diſagreeable and rattling ſounds. After continuing theſe operations for ſome time, he opens his eyes, and endeavours to raiſe himſelf on his legs. But all theſe movements are ſtill reeling and unſteady, like thoſe of a man intoxicated with liquor. He, however, reiterates his efforts till he is enabled to ſtand on his legs. In this attitude he remains fixed, as if he meant to reconnoitre and repoſe himſelf after his fatigue; but he gradually begins to walk, eat, and act in his uſual manner. This paſſage from a torpid to an active ſtate requires more or leſs time, according to the temperature of the air. When expoſed to a cold air, he ſometimes requires more than two hours to awake; and in a more temperate air he accompliſhes his purpoſe in leſs than one hour. It is probable that, when the hamſter is in his hole, this change is performed imperceptibly, and that he feels none of the inconveniences which ariſe from a ſudden and forced reviviſcence.

The hamſter is a very miſchievous animal; and ſo exceedingly fierce, that he ſeems to have no other paſſion but rage. In conſequence of this, he attacks every other animal that comes in his way, without regarding the ſuperior ſize or ſtrength of his antagoniſt; nay, as if he was ignorant of the method of ſaving himſelf by flight allows himſelf to be beat to pieces with a ſtick rather than yield. If he ſeizes a man's hand, he muſt be killed before he quits his hold. When the hamſter perceives a dog at a diſtance, he begins with emptying his cheek-pouches if they happen to be filled with grain, and which are ſo capacious as to hold a quarter of a pint Engliſh. He then blows them up ſo prodigiouſly, that the ſize of the head and neck greatly exceeds that of the body. Laſtly, he raiſes himſelf on his hind-legs, and in this attitude darts on his enemy. If he catches hold, he never quits it but with the loſs of life. But the dog generally ſeizes him behind, and ſtrangles him. This ferocious temper prevents the hamſter from being at peace with any other animal. He even makes war againſt his own ſpecies, not excepting the females. When two hamſters encounter, they never fail to attack each other, and the ſtronger always devours the weaker. A combat between a male and a female laſt longer than between two males. They begin by purſuing and biting each other; then each of them retires to a ſide as if to take breath; a little after, they renew the combat, and continur to fly and fight till one of them falls. The vanquiſhed uniformly ſerves for a repaſt to the conqueror.

The hamſters copulate about the end of April; when the males enter the apartments of the females, where they remain only a few days. If two males happen to meet in the ſame hole, a furious combat enſues, which generally terminates in the death of the weakeſt. The conqueror takes poſſeſſion of the female; and both, though at every other period they perſecute and kill each other, lay aſide their natural ferocity during the few days their amours continue. They even mutually defend each other againſt aggreſſors; and if a hole is opened about this time, the female defends her huſband with the utmoſt fury. The females bring forth twice or thrice every year. Their litter is never fewer than ſix, and more frequently from 16 to 18. Their growth is very rapid. At the age of 15 days they begin to dig the earth: and ſoon after, the mother baniſhes them from her habitation: ſo that at the age of about three weeks they are abandoned to their own management. The mother in general diſcovers little affection for her offſpring; and when her hole is opened, flies in the moſt daſtardly manner, leaving her young ones to periſh. Her only ſolicitude at that time is to provide for her own defence. With this view ſhe digs deeper into the earth, which ſhe performs with amazing quickneſs. The young would willingly follow her; but ſhe is deaf to their cries, and even ſhuts the hole which ſhe has made.

The hamſters feed upon all all kinds of herbs, roots, and grains, which the different ſeaſons produce, and even eat the fleſh of ſuch animals as they can conquer. They are particularly fond of places where liquorice grows, and feed much on its ſeeds. Their pace is very ſlow, and they do not climb; but they dig with vaſt quickneſs, and will gnaw through piece of wood an inch and a half thick in a very ſhort time. As they are not adapted for long journeys, their magazines are firſt ſtocked with the proviſions which are neareſt their abode. This is the reaſon why ſome of the chambers are frequently filled with one kind of grain only. When the harveſt is reaped, they go to a greater diſtance in queſt of proviſions and carry every article they can find, without diſtinction to ther granary. To facilitate the tranſportation of their food, nature has furniſhed them with two pouches in the inſide of each cheek. On the outſide, theſe pouches are membranous, ſmooth, and ſhining; and in the inſide there are a great many glands, which ſecrete a certain fluid, to preſerve the flexibility of the parts, and to enble them to reſiſt any accidents which may be occaſioned by the roughneſs or ſharpneſs of particular grains. Each of theſe receptacles is capable of containing an ounce and an half of grain, which, on his return to his lodgings, the animal empties, by preſſing his two fore-feet againſt his cheeks. When we meet a hamſter having his cheeks filled with proviſions, it is eaſy to ſeize him with the hand, without the riſk of being bitten; becauſe in this condition he has not the free motion of his jaws. But if he is allowed a little time, he ſoon empties his pouches, and ſtands upon his defence. The quantity of proviſions found in the holes depends on the age and ſex of the inhabitant. The old hamſters frequently amaſs 100 pounds of grain; but the young and the females content themſelves with a quantity much ſmaller. Their object in laying up proviſions, is not to nouriſh them during winter, which they paſs in ſleep, and without eating; but to ſupport them after they awake in the ſpring, and previous to their falling into a torpid ſtate, which reſembles a profound ſleep. At the approach of winter, the hamſters retire into their ſubterraneous abodes; the entrance to which they ſhut up with great addreſs. Here the animal repoſes, in the ſituation already deſcribed, upon a bed of ſtraw, and in this ſtate he is commonly dug up. They are preyed on by polecats, weaſels, cats, dogs, foxes, and birds of prey; and are proſcribed by man, on account of their devaſtations. In winter the peaſants generally go a *hamſter-neſting* as they call it; the retreat is known by a ſmall eminence of earth raiſed near the oblique paſſage formerly deſcribed. The peaſants dig down till they diſcover the hoard, and are generally well paid for their trouble; as they often find two buſhels of corn, beſides the ſkins of the animals, which are valuable furs; and it is remarkable, that the hair ſticks ſo faſt to the ſkin, that it cannot be plucked off without the utmoſt difficulty. In ſome ſeaſons the hamſters are ſo numerous, that they occaſion a dearth of corn. In one year about 11,000 ſkins, in a ſecond 54,000, and in a third year 80,000, were brought to the town houſe of Gotha, to receive a reward for their deſtruction. They are likewiſe deſtroyed by means of a paſte formed of honey and flour boiled up with arſenic or powdered hellebore.

Plate cccxix. fig. 11. 3. The arenarius, or ſand-hamſter, has the upper parts of the body hoary; the ſides, belly, limbs, and tail, pure white. It inhabits the ſandy deſarts of Baraba, on the river Irtiſh, in Siberia. The head is large, with a longiſh ſnout and a ſharp noſe, having very long whiſkers, very large pouches, and great oval browniſh ears; the body is ſhort and thick, being about four inches long, and the tail rather more than one; the fur is very ſoft; the fore feet have only four toes each, the hind feet five, all the claws being white. This animal is very fierce and untameable: it forms burrows, like the preceding ſpecies; is chiefly active at night, and feeds moſtly upon leguminous plants.

Fig. 7. 4. The ſongarus, or ſongar hamſter, has the upper parts of the body of a grey aſh-colour, marked with a black line along the back; the ſides of the head and body are varied with large white and dark brown ſpots: the feet and belly are white. It is about three inches long, with a very ſhort, thick, blunt, and hairy tail, little more than one-third of an inch in length. It inhabits the deſert of Baraba, near the Irtiſh, in Siberia; where, like its congeners, it digs chambers for the reception of proviſions. It is not, however, ſo fierce as ſome other ſpecies of the hamſters; but may be tamed when caught young, and grows very familiar.

There are two or three other ſpecies belonging to this diviſion.

Fig. 18. 5. The phæus, or rice-hamſter, has the upper parts of the body of a hoary aſh colour, with long duſky hairs along the back; the ſides whitiſh; the circumference of the mouth, breaſt, belly, and extremities of the limbs, pure, white. It is about three inches and a half long, and the tail ſcarcely one inch.—This ſpecies inhabits about Zarizyn in the deſarts of Siberia, and in the mountains of the north of Perſia; where it does vaſt miſchief in the rice fields. It is often caught in traps during winter, near ſtables and other out-houſes, and never becomes torpid.

Fig. 14. 6. The furunclus, or Baraba hamſter, has the upper parts of the body of a cinereous yellow, with a black ſtreak on the back; the under parts dirty white. It is about three inches long, and the tail near one. This ſpecies inhabits Dauria, Siberia in the deſart of Baraba, towards the Ob, between the Onon and Argun, and in the Chineſe empire near lake Dalai; living chiefly on the ſeeds of the aſtragulus and atriplex; but its manners are unknown.

IV. Myotalpæ †, or *Mole-rats*. Theſe have no external ears, very ſmall eyes, and a very ſhort tail or none. They live entirely under ground like the moles.

Plate cccxix. fig. 2. 1. The talpina, or Ruſſian mole-rat, is of a duſky colour; has a very ſhort tail, ſcarce appearing beyond the fur; and no external ears: the fore-teeth are long, extended from the mouth, and wedge-ſhaped: the eyes are very ſmall, and hid in the fur: the feet have five toes; the fore feet are very ſtrong, flat, and formed for digging. It is about four inches long, and in the general form reſembles the water rat. As to colour the head, back, and ſides are duſky, and the belly and limbs white. There is a variety (the *nigra*), which is entirely black.—This ſpecies inhabits the plains of Ruſſia and Weſtern Siberia, ſcarcely extending beyond the Irtiſh, and never beyond the Oby. It is fond of a turfy ſoil, avoiding ſandy or muddy places; and digs holes like thoſe of the hamſter, which it lines with ſoft graſs, and fills with bulbous roots, throwing up hillocks of earth all along the tracks; each individual has its ſeparate burrow: It works only in the night, and ſeldom comes out except in the ſeaſon of love. Its ſight is very weak in the day-time. It feeds chiefly on the roots of tulips, tuberoſe lathyrus, and tuberoſe phlomis. It procreates about the beginning of April, at which time it ſmells ſtrongly of muſk; and the females produce three or four young at a litter.

Plate cccxviii fig 7. 2. The capenſis, or Cape mole-rat, is of a dark brown colour tinged yellowiſh, with the fore-part of the face, orbits, and regions of the ears, white: It has a very ſhort tail, and no external ears; and is about five inches and a half long. It inhabits the Cape of Good Hope, where it infeſts the gardens.

3. The maritima, or African mole-rat, is of a pale browniſh aſh colour mixed with yellowiſh on the upper parts, the ſides and under parts paler: the tail is very ſhort; and there are no external ears. It inhabits the ſand hills adjacent to the ſea at the Cape of Good Hope; and reſembles the former ſpecies, but is much larger, meaſuring 12 or 13 inches long, and the head is more lengthened. It forms burrows in the ſand like thoſe of rabbits; and digs with ſurpriſing celerity. It runs ſlowly; but is very fierce, and bites ſeverely. It feeds chiefly on the roots of ixiæ, antholyzæ, gladioli, and irides; and is reckoned good eating.

Fig. 16. 4. The aſpalax, or Daurian mole-rat, is of a dirty yellow aſh-colour on the upper parts, and whitiſh aſh on the lower: has a very ſhort tail, and no external ears; the eyes are very ſmall, and deep ſeated; the feet have each five toes, the claws of the fore feet being very long.—This ſpecies inhabits Dauria, and Siberia beyond the Irtiſh, between the Alei and Tſcharyſch rivers. It digs very long burrows in the black turfy ſoil or firm ſand, throwing up numerous hillocks, which extend over a conſiderable ſurface; it works both with its feet and noſe, and ſometimes with its teeth. It feeds chiefly on the roots of bulbous plants. This ſpecies varies in ſize, thoſe of Dauria being near nine inches long, while thoſe farther eaſt are ſcarcely ſix.

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† Kerr—Mures ſubterranei, Gmelin.

Plate cccxviii fig. 7.

5. The typhlus, or blind mole-rat, is of a reddiſh aſh colour; and has no tail, external ears, or apparent eyes; the feet have each five toes; and the fore-teeth are broad. The body and head meaſure between ſeven and eight inches: the mouth is continually gaping, with ſhort wrinkled fore-teeth above, and very long ones below, likewiſe furrowed or wrinkled, none of them being hid by the lips: the body is covered with ſhort, ſoft, and cloſe ſet fur, which is of a duſky colour at the bottom, with the ends of a ruſty brown mixed with aſh-colour; the legs are very ſhort, having five toes on each foot armed with ſhort claws, and ſlightly connected by a ſhort membrane at their baſes. This ſpecies inhabits the ſouthern parts of Ruſſia, from Poland to the Volga. Each individual forms burrows under the turfy ſoil of very conſiderable extent, with many lateral paſſages, and throws out the earth at different diſtances, in large hillocks ſometimes two yards in circumference, and proportionally high. It works with its ſnout, feet, rump, and even with its teeth; and digs with great celerity, eſpecially when frightened, in which caſe it digs directly downwards. When irritated, it ſnorts, gnaſhes its teeth, raiſes its head in a menacing poſture, and bites with great ſeverity. It feeds on roots, eſpecially thoſe of the bulbous chærophyllum. It is entirely blind, though it has the rudiments of very ſmall eyes, which are covered over with a continuation of the ſkin; but it poſſeſſes the ſenſes of touch and hearing in a very eminent degree, to make up for the loſs of ſight. It breeds in ſpring and ſummer; and the female, which has two teats, brings from two to four young ones at a birth.

The *Marmot*, *Agouti*, *Guinea-pig*, *Cavy*, *Jerboa*, *Dormouſe*, &c. which were formerly comprehended under the preſent genus in the Linnæan arrangement, have, in conſequence of more accurate inveſtigation, been lately disjoined, and diſtributed under four new genera, *Myoxus*, *Arctomys*, *Dipus*, and *Cavia**. But as we are paſt the alphabetical order in which the three laſt of thoſe genera ſhould have been introduced, we muſt ſtill deſcribe the above animals (excepting the firſt) in this place; obſerving, however, to diſtinguiſh them according to their new generic arrangement.

I. Myoxus, or *Dormouſe*. See Myoxus, the *Marmot*.

II. Arctomys, the *Marmot;* the characters of which genus are: There are two wedge-like cutting teeth in each jaw; the grinders are five above, and four below, on each ſide; and there are perfect clavicles or collar bones.

Plate cccxvii. fig. 7.

1. The marmotto, or common marmot, has ſhort round ears; gibbous cheeks; a ſhort hairy tail; the upper part of the body of a duſky brown colour, and the lower parts reddiſh. The body and head meaſure 10 inches, the tail ſix. This ſpecies inhabits the ſummits of the Alps and Pyrenean mountains, in dry places where there are no trees. It is more ſubject to be rendered torpid by cold than any other. In the end of September, or beginning of October, he retires into his hole, from which he comes not out till the beginning of April. His retreat is capacious, broader than long, and very deep, ſo that it can contain ſeveral marmots without any danger of corrupting the air. With their feet and claws; which are admirably adapted for the purpoſe, they dig the earth with ſurpriſing quickneſs, and throw it behind them. It is not a hole, or a ſtraight or winding tube, but a ſpecies of gallery made in the form of a Y, each branch of which has an aperture, and both terminate in one where the animal lodges. As the whole is made on the declivity of a mountain, the innermoſt part alone is on a level. Both branches of the Y are inclined, and the one is uſed for depoſiting the excrements of the animals, and the other for their going out and coming in. The place of their abode is well lined with moſs and hay, of which they make ample proviſion during the ſummer. It is even affirmed, that this labour is carried on jointly; that ſome cut the fineſt herbage, which is collected by others, and that they alternately ſerve as vehicles for tranſporting it to their dens. One, it is ſaid, lies down on his back, allows himſelf to be loaded with hay, extends his limbs, and others trail him in this manner by the tail, taking care not to overſet him. Theſe repeated frictions are aſſigned as the reaſon why the hair is generally rubbed off their backs. But it is more probable, that this effect is produced by their frequent digging of the earth. But, whatever may be in this, it is certain that they dwell together, and work in common at their habitations, where they paſs three-fourths of their lives. Thither they retire during rain or upon the approach of danger; and never go out but in fine weather, and even then to no great diſtance. One ſtands centinel upon a rock, while the others ſport on the graſs, or are employed in cutting it to make hay. When the centinel perceives a man, an eagle, a dog, &c. he alarms the reſt with a loud whiſtle, and is himſelf the laſt to enter the hole. They make no proviſions for winter; nor have they in that ſeaſon any occaſion for them, as lying aſleep all that time. As ſoon as they perceive the firſt approaches of the ſleeping ſeaſon, they ſet to work in ſhutting up the two entrances of their habitation; and this they perform with ſuch labour and ſolidity, that it is eaſier to dig the earth any where elſe than in the parts they have fortified. They are at this time very fat, weighing ſometimes 20 pounds; and they continne to be plump for three months; but afterwards they gradually decay, and are extremely emaciated at the end of winter. When diſcovered in their retreats, they are found rolled up in the form of a ball, covered with hay; and they are carried off in ſo torpid a ſtate, that they may be killed without ſeeming to feel pain. When taken young, they may be rendered nearly as tame as our other domeſtic animals. They are able to walk on their hind-feet, ſit up often on their haunches; and carry food to their mouths with their fore-feet. They learn to ſeize a ſtick, to dance, to perform various geſticulations, and to obey the voice of their maſter. Like the cat, the marmot has an antipathy againſt dogs. When he begins to be familiar in the houſe, and perceives that

* See Gmelin's edition of the Syſtema Naturæ; and the very elaborate and more ample edition in Engliſh, publiſhing by Kerr.

that he is protected by his maſter, he attacks and bites dogs of the moſt formidable kind. Though not ſo large as a hare, he is ſtouter, and his ſtrength is aided by a peculiar ſupplenеſs and dexterity. With his fore-teeth, which are pretty long, he bites moſt cruelly: he attacks not, however, either dogs or men unleſs previouſly irritated. If not prevented, he gnaws furniture and ſtuffs; and when confined, pierces even through wood. His voice reſembles the murmuring of a young dog when careſſed or in a ſporting humor; but when irritated or frighted, he makes a whiſtling noiſe, ſo loud and piercing, that it hurts the ear. The marmots eat every thing preſented to them: as fleſh, bread, fruit, roots, pot-herbs, may-bugs, graſshoppers, &c. but milk and butter they prefer to every other aliment. Though leſs inclined to theft than the cat, they endeavour to ſlip into the dairy, where they drink great quantities of milk, making, like the cat, a murmuring noiſe expreſſive of pleaſure. Milk is alſo the only liquor that is agreeable to them; for they rarely drink water, and they refuſe wine. They procreate but once a year, and the female, after three or four weeks, produces two, three, or four young. The growth of their young is very quick; they live only nine or ten years, and the ſpecies is neither numerous nor much diffuſed. They are eaſily caught when on plain ground, but with difficulty in their holes, as they dig deeper when in danger of being taken, except in winter when torpid; at which time they are caught in great numbers. They are ſearched for partly on account of their fleſh, which is tender and delicate; partly for their ſkins: and partly for their fat which is eſteemed medicinal by the inhabitants of the Alps: but they are chiefly taken by the Savoyards for the purpoſe of being expoſed as ſhows through various parts of Europe. The marmot would make very good eating, if it had not always a diſagreeable flavour, which cannot be concealed but by ſtrong ſeaſonings.

Plate CCCXVII fig. 6. 2. The monax, or American marmot, is about the ſize of a rabbit. It has ſhort rounded ears: the noſe and cheeks are bluiſh; the body is of a deep brown colour; the tail is longiſh, and very hairy. This ſpecies inhabits the warmer ſtates of North America and the Bahamas. It forms holes in the clefts of rocks and under the roots of trees, in which it paſſes the winter in a torpid ſtate; though it is uncertain if thoſe of the Bahamas hybernate, as the climate of theſe iſlands is very mild. It feeds on vegetables; and its fleſh is very good, reſembling that of a pig.

Plate CCCXIX, fig. 23. 3. The bobac, or Poliſh marmot, is of a greyiſh colour, mixed with long duſky hairs on the upper parts of the body, the under parts yellowiſh; It has ſmall oval ears, ſmall eyes, a hairy ſtraight tail, and the fore-feet have each a claw in place of the thumb or fifth toe. The head and body meaſure ſixteen inches, the tail four and a half. This ſpecies inhabits the dry and ſunny places of the mountains, from the Boriſthenes through the temperate climes of Aſia as far as China and Kamtſchatka. It forms very deep burrows, in which ſocieties of 20 or more live together, each individual having a particular neſt at the bottom of the common gallery, which is often three or four yards deep, and from which numerous galleries or paſſages branch off to the ſeveral apartments. They go about in ſearch of food in the morning and middle of the day, placing a centinel to give warning of approaching danger. The bobac is a timid animal, and feeds only on vegetables, chiefly oleracious plants. It ſits up on the hams, and carries its food with the fore paws to its mouth, and defends itſelf in the ſame poſture. It may be eaſily tamed even when old; it then eats cabbages or bread, and laps milk; but refuſes to drink water. In ſummer it feeds voraciouſly; but remains torpid all winter, except when kept in very warm places; and even then it eats very little; and eſcapes if poſſible, that it may get to ſome place proper for hybernating; but returns to its maſter in ſpring. The fleſh reſembles that of a hare, though rank; the fat is uſed for dreſſing leather and furs; and the ſkins are employed for clothing by the Ruſſians. The female has eight teats; and probably brings forth early, as by the month of June the young ones are half grown.

Plate CCCXVII, figs. 1, & 4 4. The citillus, or earleſs marmot, is of a variable colour, has a convex head, no external ears, and a ſhort hairy tail. This ſpecies inhabits the ſouthern parts of Ruſſia as far as Kamtſchatka, and the iſlands between Aſia and America; is found in Perſia and China; but is now rarely met with in the reſt of Europe. They dwell in open, high, dry, and uncultivated places, preferring turfy and loamy ſoils, near the high roads, and never frequent bogs or woods. Each individual has its ſeparate burrow, in which, for proviſion in the beginning aud end of winter, it lays up magazines of grain, tender vegetables, and berries; ſometimes though rare, the carcaſes of mice and ſmall birds are added. In the middle of winter theſe animals lie torpid during the greateſt ſeverity of the froſt. From the very beginning of ſpring, as ſoon as the weather becomes mild, they go out in the day time in queſt of food, which they eat ſitting on their haunches, carrying it in their fore paws to the mouth. The male is very eaſily tamed; but the female is fiercer, more given to bite, and is leſs eaſily made tame; ſhe goes between there and four weeks with young, and brings forth from three to eight young ones about the beginning of May. The fur is very good in the ſpring, and the fleſh is reckoned tolerable. They are preyed on by polecats, weaſels, hawks, carrion crows, and cranes.

This animal varies conſiderably both in ſize and colour, being ſometimes as large as the common marmot, and ſometimes not larger than the water-rat. In general the colour is of a yellowiſh aſh on the upper parts, and dirty white on the belly, (the *zizel* of Buffon); ſometimes it is variegated either with waves or ſmall ſpots of white, (the ſouſlik of the ſame author.) Some are white on the upper parts, and waved with tawny or yellow, being pale yellow on the yellow parts of the body, and having a longiſh tail, with ſhed hair like that of a ſquirrel; others are of a grey colour on the upper parts of the body, ſpotted with white; the under parts being of a yellowiſh white, with white orbits, and the face, between the eyes and the noſe, of a browniſh yellow, with a ſhort tail.

Fig. 8, 5. The empetra, or Canadian marmot, is of a mixed grey colour on the upper parts of the body; the lower parts orange: having ſhort rounded ears, and a hairy tail. It is rather larger than a rabbit, and the tail is about two inches and a half long; the head is round, with a blunt noſe, and ſhort rounded ears; the cheeks are full, and of a grey colour: the face is dusky, with a black nose: the hair on the back is grey at the roots, black in the middle, and whitiſh at the tips; the belly and legs are of an orange colour; the feet are black and naked, having four long, ſlender, divided toes, and the rudiments of a thumb on each fore foot, and five ſmaller on each behind, all armed with pretty ſtrong claws. This animal was deſcribed by Mr Pennant from a living ſpecimen in poſſeſſion of Mr Brooks, which was very tame, and made a hiſſing noiſe. It inhabits Canada, Hudſon's Bay, and the other northern parts of America.

Five or ſix other ſpecies of arctomys, ſome of them ſuſpected to be only varieties, are deſcribed by Kerr.

III. Dipus, or *Jerboa*. There are two fore teeth in each jaw: the tail is long, and tufted at the end: but the moſt ſtriking characteriſtic of this genus is the enormous length of the hind feet and extreme ſhortneſs of the fore-paws. From this conformation, inſtead of walking or running on all fours, they leap or hop on the hind-feet like birds, making prodigious bounds, and only uſe the fore paws for burrowing, or for carrying their food to the mouth like ſquirrels. From this peculiarity of conformation, the kanguru, G. xix. ſp. 15. and Philip's opoſſum, ſp. 16, of the ſame genus (Mr Kerr obſerves), ought to have been arranged with this genus of the jerboa; but from a rigid adherence to artificial ſyſtem, they are by Dr Gmelin ranked with the genus opoſſum on account of the number and arrangement of their teeth. See the article Didelphis.

1. The jaculus, or common jerboa, has four toes on all the feet, and a claw in place of a thumb or fifth toe on each fore-foot. The body is ſomewhat more than ſeven inches long, and the hind legs and thighs are longer than the body. The upper parts are of a pale tawny colour, and the under parts white; the ears and feet are fleſh coloured. The female has eight diſtantly placed teats. Theſe animals inhabit Egypt Arabia, Calmuck Tartary, and ſouthern Siberia They frequent firm hard ground, and fields covered with graſs and herbs, where they form burrows of ſeveral yards long in a winding direction, leading to a large chamber about half a yard below the ſurface; and from this a ſecond paſſage is dug to within a very little of the ſurface, by which they can eſcape when threatened with danger. When at reſt they ſit with their hind legs bent under their belly, and keep the fore legs ſo near the throat as hardly to be perceptible. They eat grain and herbage like the hare. Their diſpoſitions are mild, and yet they can never be perfectly tamed. Two that were kept in a houſe in London borrowed almoſt through the brick-wall of the room where they were; they came out of their hole at night and fed: and when caught were much fatter and ſleeker than when confined to their box.

This Animal is eaten by the Arabs, who call it the *lamb of the children of Iſrael*. It has been particularly noticed and deſcribed by Mr Bruce in his Abyſſinian Travels*. He ſays it inhabits the ſmootheſt places of the deſart, eſpecially thoſe where the ſoil is fixed gravel. In this it burrows, and has its hole divided into many apartments. It ſeems, however, to be afraid of the ground falling in upon it, as it chooſes always to dig under the roots [illegible] ſhrub. It particularly delights in thoſe places which are frequented by the cereſtes or horned viper, though it would appear that the ſerpent ſometimes preyed upon it; for Mr Bruce tells us that he once ſaw a jerboa taken out of the belly of a female viper big with young, and almoſt conſumed by the digeſtive powers of the animal. It is a very cleanly creature, and keeps its hair always in excellent order. It jumps about with great agility, in which it is aſſiſted by its long tail, which we ſhould ſuppoſe would rather be a hindrance to it. The Arabs of the kingdom of Tripoli in Africa teach their greyhounds to hunt the Antelope, by learning them firſt to catch jerboas; and ſo agile are the latter, that Mr Bruce has often ſeen, in a large court-yard or incloſure, the greyhound employed a quarter of an hour before he could kill his diminutive adverſary; and had he not been well trained, ſo that he made uſe of his feet as well as his teeth, he might have killed two antelopes in the time he could have killed one jerboa. This animal is very fat, and the fleſh well coloured: the buttocks, thighs, and part of the back, are roaſted and eaten by the Arabs, as already mentioned, and taſte almoſt exactly like a young rabbit, but without the ſtrong ſmell of the latter. It is ſaid, that the fleſh dried in the air is very nouriſhing, and prevents coſtiveneſs; ſo that it ſeems endowed alſo with medical qualities. The animal is found in moſt parts of Arabia and Syria, and in all parts of the ſouthern deſart of Africa, but no where in ſuch plenty as in the Cyrenaicum or Pentapolis. In his journey thither, Mr Bruce employed ſeveral Arabs, together with his own ſervants, to kill theſe animals with ſticks, that their ſkins might not be hurt with ſhot. Having got them dreſſed in Syria in Greece, and ſewed together, making uſe of the tail, as in ermine, for the lining of a cloak, he found they had a very good effect, making a finer and gloſſier appearance the longer they were worn.

Bochart thinks this animal is the *Saphon* of holy writ, and diſplays a vaſt deal of learning on the ſubject. But this opinion is refuted by Mr Bruce, who obſerves, that the ſaphon is gregarious, and builds in rocks; being likewiſe diſtinguiſhed for its feebleneſs, which it ſupplies by its wiſdom; and none of theſe characters apply to the jerboa: "therefore (ſays Mr Bruce) though he chews the cud in common with ſome other, and was in great plenty in Judea, ſo as to be known to Solomon, yet he cannot be the ſaphon of Scripture." He ſuppoſes with great probability, that it is the crearure termed the *mouſe*, Iſa. lxvi. 17; and ſays that in the Arabic verſion the word is expreſsly tranſlated *jerboa*. See the article Saphon.

2. The ſagitta, or Arabian jerboa, has three toes on the hind feet, and no thumb or fifth toe on the fore-paws. It is only about ſix inches long, and the tail rather ſhorter than the body; the ſoles of the hind feet and bottom of the toes are covered with a very thick coat of hair; the head is more rounded than that of the preceding animal, and the ears are much longer than the head. It inhabits Arabia, and near the [illegible] in Siberia, where it frequents the ſandy plains.

The two following are diſtinguiſhed as different ſpecies by Mr Pennant, though Dr Gmelin ſeems not to have conſidered them as diſtinct from the preceding.

A. The

* Vol. V. p. 121.

Plate cccxviii. fig. 6. A. The ægyptius, or Egyptian Jerboa, has three toes only on the hind feet; and four toes with a ſcarcely apparent thumb or fifth toe, furniſhed with a claw on the fore-paws.

This animal Mr Pennant ſuppoſes to be the *mus bipes* of the ancients, *mus ſagitta* of Pallas, *jerbo* of Buffon, and *daman Iſrael* of the Arabs. He ſays that it inhabits Egypt, Barbary, Paleſtine, the deſarts between Baſora and Aleppo, the ſandy tracks between the Don and Volga, and the hills ſouth of the Irtiſh.

Fig. 17. B. The ſibricius, or Siberian jerboa, with three toes on the hind feet, and two ſpurious toes ſome way up the legs; five toes on the fore feet, the thumb or fifth toe having no nail. Of this ſpecies Mr Pennant diſtinguiſhes four varieties, the major, medius, minor, and pumilio; differing in ſize, colour, &c. But they all (he ſays) agree in manners. They burrow in hard ground, clay, or indurated mud; not only in high and dry ſpots, but even in low and ſalt places. They dig their holes with great celerity, not only with their fore-paws but with their teeth, and flinging the earth back with their hind feet ſo as to form a heap at the entrance. The burrows are many yards long, but not above half a yard deep. Theſe run obliquely; and end in a large ſpace or neſt, the receptacle of the fineſt herbs. They have uſually but one entrance; yet by a wonderful ſagacity they work from their neſt another paſſage to within a very ſmall ſpace of the ſurface, which in caſe of neceſſity they can burſt through, and ſo eſcape.

They ſleep rolled up with their head between their thighs: At ſun-ſet they come out of their holes, clear them of the filth, and keep abroad till the ſun has drawn up the dews from the earth. On approach of any danger they immediately take to flight, with leaps of a fathom in height, and ſo ſwiftly that a man well mounted can hardly overtake them. They ſpring ſo nimbly, that it is impoſſible to ſee their feet touch the ground. They do not go ſtraight forward, but turn here and there till they gain a burrow, whether it is their own or that of another. When ſurpriſed, they will ſometimes go on all fours, but ſoon recover their attitude of ſtanding on their hind legs like a bird: even when undiſturbed, they uſe the former attitude; then riſe erect, liſten, and hop about like a crow. In digging or eating they drop on their fore legs; but in the laſt action will often ſit up and eat like a ſquirrel. They are eaſily tamed; and ſeek always a warm corner. They foretel cold or bad weather by wrapping themſelves cloſe up in hay; and thoſe which are at liberty ſtop up the mouths of their burrows. In a wild ſtate they live much on oleraceous plants: the ſmall ſtature of the pumilio is attributed to its feeding on ſaline plants. Thoſe of the middle ſize, which live beyond the lake Baikal, feed on the bulbs of the *lilium pomponium*, and they gnaw the twigs of the *robinia caragana*. When confined, they will not refuſe raw meat or the entrails of fowls.—They are the prey of all leſſer rapacious beaſts; and the Arabs, who are forbidden all other kinds of mice, eſteem theſe the greateſt delicacies. The Mongols have a notion that they ſuck the ſheep: certain it is they are during night very frequent among the flocks, which they diſturb by their leaps. Theſe animals breed often in the ſummer; in the ſouthern parts in the beginning of May; beyond Baikal not till June. They bring perhaps eight at a time, as they have ſo many teats. They ſleep the whole winter without nutriment. About Aſtracan, they will ſometimes appear in a warm day in February; but return to their holes on the return of cold.

3. The cafer, or Cape jerboa, has four toes on the hind-feet and five on the paws; the tail is very hairy, and tipt with black.—This ſpecies, which inhabits the Cape of Good Hope, is larger than any of the foregoing, being 14 inches long, the tail 15, the ears three. It is called *aerdmannetie*, or little earth man, and *ſpringen haas*, or leaping hare, by the Dutch at the Cape. It has a grunting voice; is very ſtrong, and leaps 20 or 30 feet at one bound. It burrows with its fore-feet; and ſleeps ſitting on its hind legs, with the knees ſeparated, the head between, and holding its ears with the fore-paws over its eyes. It is eaten by the natives; and is caught by pouring water into its hole, which forces it to come out.

Plate cccxix. fig. 6. 4. The meridianus, Caſpian jerboa, or long-legged mouſe, has five toes behind and three before, with the rudiments of a thumb or inner toe. It is five inches long, and the tail three.—This ſpecies inhabits the ſandy deſarts between the Ural and Volga, near the Caſpian. It forms burrows, with three entrances, about a yard in depth; and feeds chiefly on the ſeeds of the pterococci and aſtragali.

Fig. 19. 5. The tamaricinus, or marſh jerboa, has five toes behind and three before, with the rudiments of a fourth; the tail is obſcurely annulated. The body and head meaſure about five inches and a half in length; the tail is about the ſame length.—This ſpecies inhabits the ſalt marſhes near the Caſpian ſea; and is ſuppoſed to feed on the fruit of the tamarix and nitrarium, which grow in theſe marſhes. Under the roots of theſe trees it forms very deep burrows, which have two entrances. It is a very elegant little animal. There are two or three other ſpecies of this genus.

IV. The Cavia, or *Cavy*; a genus which ſeems to hold a middle place between the murine and the leporine quadruped. The characters are: there are two wedge-like cutting teeth in each jaw, and eight grinders in both jaws: the fore-feet are furniſhed with four or five toes: the hind feet with three, four, or five each: the tail is either very ſhort or entirely wanting: there are no clavicles or collar-bones.

Plate cccxvii, fig. 13. 1. The paca, or ſpotted cavy, has five toes on all the feet; and the ſides are marked with rows of grey or pale yellow ſpots. The body and head meaſure about two feet in length; the tail is like a ſmall button, and ſo extremely ſhort as to be hardly apparent; the mouth is very ſmall, and the upper lip is divided; the noſtrils are very large, and the muzzle is garniſhed with long whiſkers; the ears are ſhort and roundiſh; the eyes are large, prominent, and browniſh; the two cutting teeth in each jaw are very long and of great ſtrength; the hind legs are longer than the fore.—This ſpecies inhabits Braſil, Guiana, and probably all the warmer parts of America. It lives in fenny places near rivers, burrowing in the ground, and keeping its hole exceedingly clean, to which it has always three diſtinct outlets: It grows very fat, and is eſteemed a great delicacy. The female has two teats ſituated between the hind thighs, and has only a ſingle young one at a litter.—It is difficult to take this animal alive. When ſurpriſed in its hole, which the hunters lay open both before and behind, it defends itſelf, and even bites fiercely. It is however, eaſily accuſtomed to a domeſtic life. Unleſs induſtriouſly irritated, it is gentle and tractable, fond of adulation, and licks the hands of the perſon who careſſes it. It knows thoſe who take care of it, and readily diſtinguiſhes their voices. When gently ſtroaked on the back, it ſtretches itſelf out, lies down on its belly, by a ſmall cry expreſſes its acknowledgement, and ſeems to aſk a continuance of the favour: but if ſeized in a rough manner, it makes very violent efforts to eſcape. When kept in a wooden cage or box, this animal remains perfectly tranquil during the day, eſpecially when plentifully ſupplied with food. It ſeems even to have an affection for its retreat as long as the day laſts; for, after feeding, it retires ſpontanouſly into it. But when night approaches, by perpetual reſtleſſneſs and agitation, and by tearing the bars of its priſon with its teeth, it diſcovers a violent deſire of getting out. Nothing of this kind happens during the day, unleſs it has occaſion for ſome natural evacuation, for it cannot endure the ſmalleſt degree of dirtineſs in its little apartment; and when about to void its excrements, always retires to the moſt diſtant corner it can find. When its ſtraw begins to ſmell, it often throws it out, as if it meant to demand freſh litter. This old ſtraw it puſhes out with its muzzle, and goes in queſt of rags or paper to replace it. In a female cavy, the following extraordinary inſtance of cleanlineſs was obſerved. A young male rabbit being ſhut up with her when ſhe was in ſeaſon, ſhe took an averſion to him the moment he voided his excrement in their common apartment. Before this ſhe was very fond of him; licked his noſe, ears and body; and allowed him to take almoſt the whole food that was given her. But as ſoon as the rabbit had infected the cage with his ordure, ſhe retired into the bottom of an old preſs, where ſhe made a bed with paper and rags, and returned not to her old lodging till ſhe ſaw it neat, and freed from the unclean gueſt which had been preſented to her.

Plate CCCXVII fig. 10, 11.

2. The agouti, which is about the ſize of a rabbit, has a very ſhort tail; four toes on the fore feet, and three on the hind ones; the upper parts of the body of a browniſh colour mixed with red and black, the rump orange, and the belly yellowiſh. Of this ſpecies there are three varieties mentioned by authors, viz. the leſſer cunicularis or long noſed cavy, which is about the ſize of a rabbit; the leporina or larger rabbit, called the *java hare*, or *javan cavy*, which is as large as a hare; and the americana, which ſeems to be but little known. They all inhabit South America and the Weſt India Iſlands; dwelling in hollow trees, or burrowing in the ground. They ſearch for their food, which is entirely vegetable, during the day, and carry it home with them to their dwellings: when feeding they ſit on their hind legs, and carry their food with the fore-paws to the mouth. They grow very fat and are very good eating, their fleſh being white and ſavoury like that of a rabbit. They breed frequently in the ſame year, the female bringing three, four or five young ones at a birth. They grunt like pigs are very voracious, and when fat, their fleſh is white like that of a rabbit, but dry. What food they cannot immediately conſume they hoard in their retreats, and eat at their leiſure. Their pace is hopping like that of a hare or rabbit; they beat the ground like them with their feet, when angry; they ſtop and liſten to the ſound of muſic; and they take ſhelter when purſued, in their holes, or in hollow trees.—They are hunted with dogs. When one of them is forced among the cut ſugar canes, he is ſoon taken; becauſe theſe grounds being generally covered a foot thick with ſtraw and leaves, at each leap he ſinks in this litter, ſo that a man may overtake and ſlay him with a baton. He commonly runs very nimbly before the dogs; and when he gains his retreat, he lies ſquat, and remains obſtinately in his concealment. The hunters are obliged to chace him out by filling his hole with ſmoke. The animal, half ſuffocated, utters mournful cries; but never iſſues forth unleſs when puſhed to the laſt extremity. His cry, which he often repeats when diſturbed or irritated, reſembles that of a ſmall hog. If taken young he is eaſily tamed, and goes out and returns of his own accord.

Fig. 5.

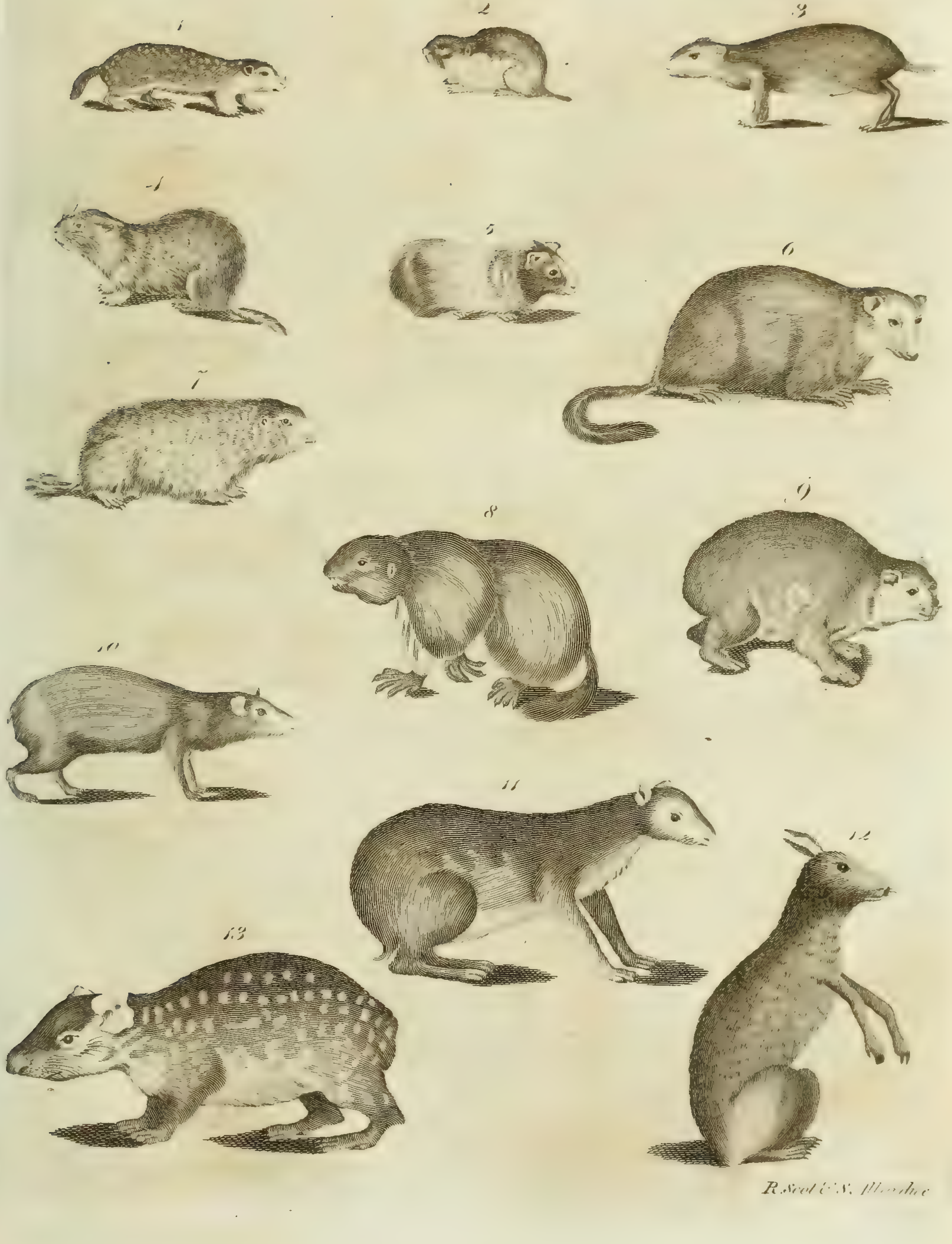
3. The cobaya or reſtleſs cavy, has four toes on the fore and three on the hind-feet, with no tail: it is about ſeven inches in length; and the whole body is white, uſually variegated with irregular orange and black blotches. This ſpecies inhabits Braſil; but its manners in a wild ſtate are not mentioned by authors. In a domeſtic ſtate, as they appear in Europe, they are very reſtleſs and make a continual noiſe.—They feed on all kinds of herbs; but eſpecially on parſley, which they prefer to grain or bread; and they are likewiſe fond of apples and other fruits. They eat precipitately like the rabbit, little at a time, but very often. Buffon ſays they never drink; but Gmelin, that they drink water. Their voice is commonly a kind of grunt like a young pig; when engaged in their amours, it reſembles the chirp of a bird; and when hurt, they emit a ſharp cry. They are of a tame and gentle, but ſtupid diſpoſition. The female breeds at two months old, bringing from four or five to ten or twelve young ones at a birth, though ſhe has only two teats; and breeds very often during the year, as ſhe goes but three weeks with young, and takes the male 12 or 15 days after littering. As they breed ſo faſt their multitudes would be innumerable, if there were not ſo many enemies which deſtroy them. They cannot reſiſt either cold or moiſture: when cold, they aſſemble and crowd cloſe together; in which caſe they often all periſh together. They are alſo devoured in great numbers by cats, and many are killed by the males. Rats are ſaid to avoid their haunts. They are called in England *Guinea-pigs*, from their being ſuppoſed to come from that country.

Fig. 12.

4. The magellanica, or Patagonian cavy, has hardly any tail; the ſides of the noſe are garniſhed with tufts of curly hair and long numerous whiſkers. This ſpecies inhabits the country about Port Deſire in Patagonia, and is of conſiderable ſize, ſometimes weighing 26 pounds. It has the ſame manners with the reſt of the genus; it ſits on its hind legs, burrows in the ground, and feeds on vegetables. The fleſh is very white, and has an excellent flavour.

Mus

Plate CCCXVII



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Mus **Plate CCCXVIII**

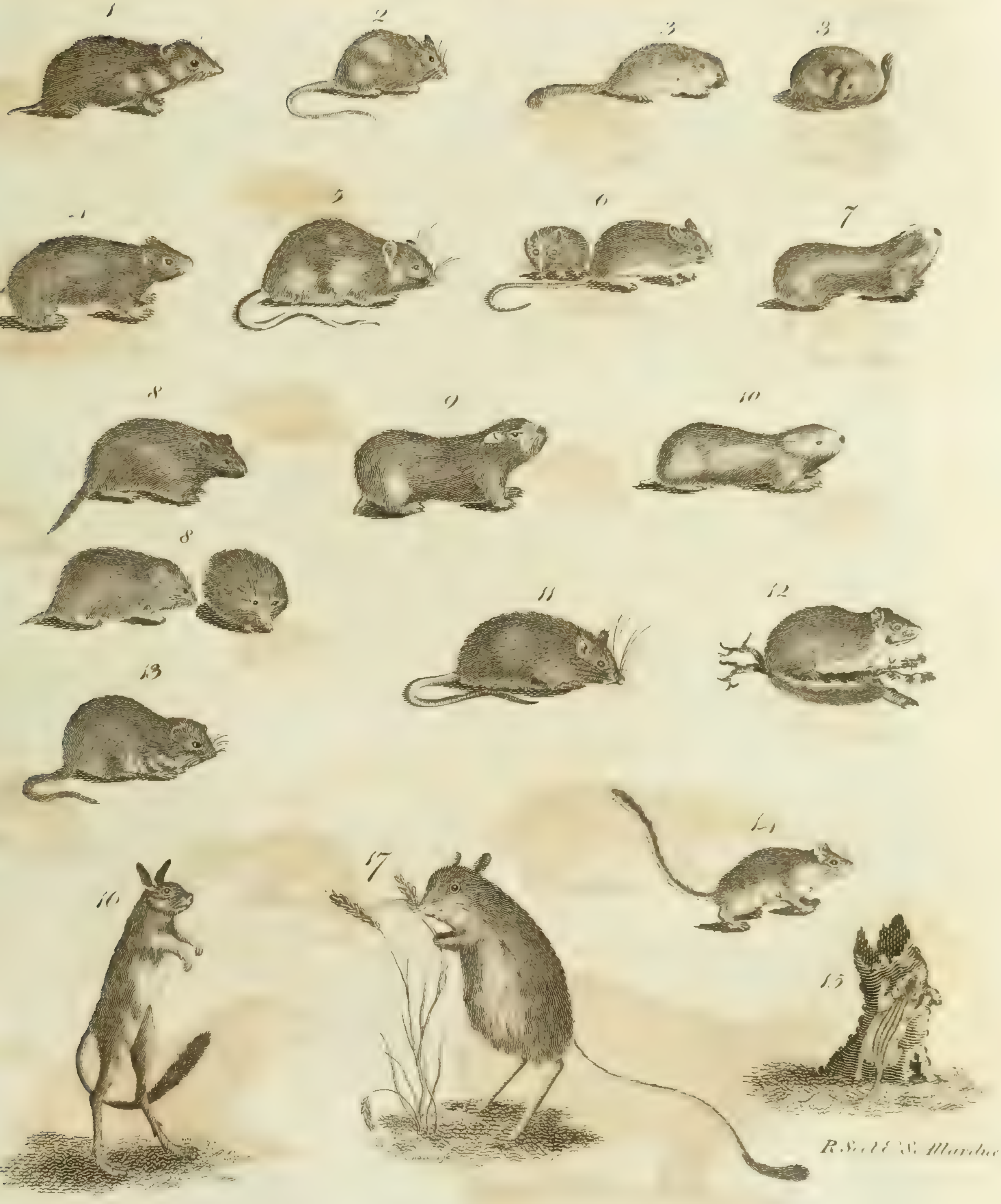

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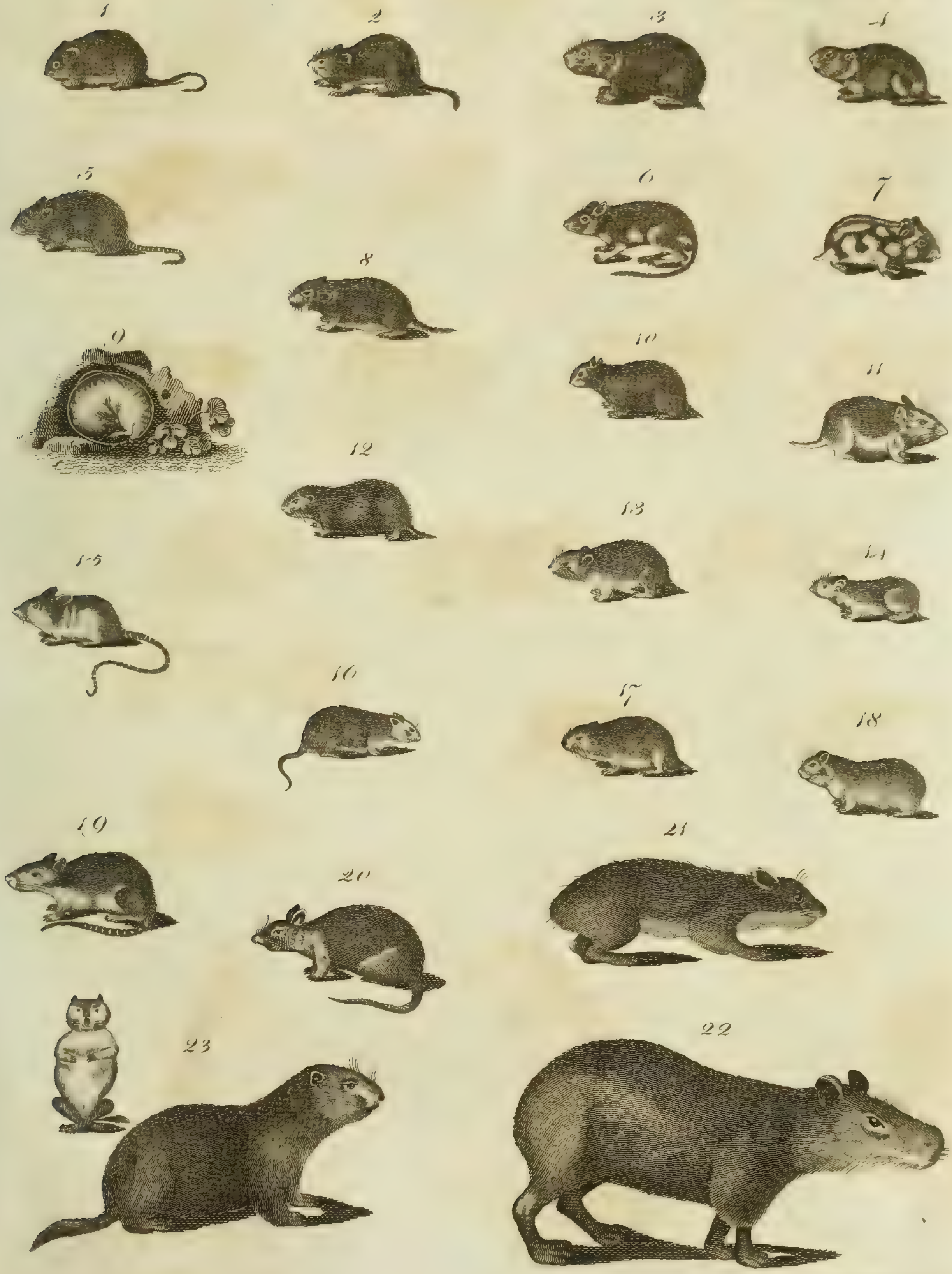
Plate CCCXIX



R.Scott & S.Mardie

Mus. Plate CCCXIX. fig. 22. 5. The capybara, or thick noſed tapir, has no tail; the hind feet have each three webbed toes. The length of the animal, when full grown, is above two feet and a half: the head and noſe are very large and thick; having ſmall, erect, rounded, naked ears, and large black eyes: and the noſe is garniſhed with numerous black whiſkers: in each jaw are two large ſtrong fore-teeth, and eight grinders; the legs are ſhort, having the toes connected by a web, and their extremities are guarded with a kind of hoofs inſtead of claws; the neck is ſhort and thick; the hair is ſhort, rough and harſh, like briſtles, being longer on the back, and moſt of them are yellowiſh in the middle and black at both ends.—This ſpecies inhabits the eaſtern ſide of South America, from the iſthmus of Darien to Brazil and Paraguay; living in fenny woods near the large rivers, ſuch as the Amazons, Oroonoko, and Plata. They ſwim and dive remarkably well, and keep for a long time under water. They catch fiſh at night with great dexterity, and bring them on ſhore to eat them; which they do ſitting on the hind legs, and holding the food in the fore-paws like the apes. They likewiſe live on fruits and vegetables, eſpecially the ſugar cane, and feed only in the night. They keep together in large herds, making a great noiſe like the braying of aſſes, and do vaſt miſchief in gardens. They grow very fat; and the fleſh is eaten, being tender, but has an oily and fiſhy flavour. In the breeding ſeaſon, one male and one female live together, and the female only produces a ſingle one at a birth. Theſe animals are eaſily rendered tame, and become very familiar.

Plate CCCXVII. fig. 3. 6. The acuſchy, or olive cavy, has a ſhort tail; the upper parts of the body are of an olive colour, the under parts whitiſh. This ſpecies inhabits Guiana, Cayenne, and Braſil.—It is about the ſize of an half-grown rabbit, is eaſily tamed, and is reckoned very delicate food. The female brings one, ſometimes two at a litter. This animal reſembles the agouti, but is uniformly ſmaller, has a tail of ſome length, and is of a different colour. It inhabits the woods, living on fruits; abhors water; and ſometimes, though rarely, makes a cry like that of the reſtleſs cavy.

There are five or ſix other ſpecies deſcribed by authors as belonging to the cavy genus. Two of them, however, have been lately marked by Dr Gmelin under a new genus, *Hyrax;* which, as there was not an opportunity of introducing it in the order of the alphabet, we ſhall here ſubjoin together with the deſcriptions of the ſpecies as given by Mr Kerr.

V. Hyrax, or *aſhkoko*. There are two broad and diſtant fore-teeth above; four contiguous, broad, flat, notched fore-teeth below; and four large grinders on each ſide in both jaws. The fore feet have four toes, the hind feet only three. There is no tail; and the clavicles are wanting.

Fig. 9. 1. The capenſis, or cape aſhkoko, "has flat nails on all the toes, except one toe of each hind-foot which is armed with a ſharp pointed claw. It inhabits the Cape of Good Hope.—This animal is about the ſize of a rabbit, being about 15 inches long; the head is ſhort, with the back part very thick, and the ſnout very ſhort and blunt; the eyes are ſmall; the ears are oval and open, brown, woolly, and half hid in the fur; the legs are very ſhort, the upper joints of both being concealed beneath the ſkin; the hind legs are rather longer than the fore; the feet are large, black, and naked; the body is ſhort, thick, and contracted, with a prominent belly, and is covered with a ſoft woolly fur of a yellowiſh brown or greyiſh colour, heary at the roots; the ſides are of a dirty whitiſh grey; and along the back is a browniſh ſtripe: the fur is interſperſed with longer and coarſer black hairs; and a few very coarſe long briſtles. The fore feet have four ſhort, ſcarce divided, thick toes, furniſhed with flat nails; the two outer toes of the hind-feet are ſimilar, but the inner toe is longer, and has a ſharp claw. This animal has a ſharp voice, and acute ſenſe of hearing; its gait is very wavering and unſteady, owing to the ſhortneſs of its thighs and unequal length of the hind and fore legs; notwithſtanding of which it is very active and moves by leaps: it is very cleanly living entirely on vegetable food, drinks little, is fond of heat and burrows in the ground. In manners and general appearance, this animal reſembles the marmot and cavy; in the conformation of its toes it has ſome analogy with the maucauco; but from the circumſtances of the teeth it cannot be ranked with the laſt; and the peculiarity of the feet has cauſed Dr Gmelin to ſeparate it from both of the former."

Plate CCCXIX. fig. 21. 2. The ſyriacus, or Syrian aſhkoko, (Bruce, Schreber), "has ſoft tender nails on all the toes. It inhabits Syria and Ethiopia.—The body of this is more lengthened than that of the former, and the ſnout more oblong. The fur is of a reddiſh grey colour like that of the wild rabbit, the throat, breaſt, and belly, being white; all over the body a number of long, ſtrong and poliſhed hairs are ſcattered among the fur. The body and head of the individual deſcribed by Mr Bruce meaſured 17 inches. The ears are broad, open, and rounded; each ſide of the mouth is garniſhed with long whiſkers. In walking, which is performed creeping low with the belly almoſt touching the ground, the hind feet are uſed as far as the heel. All the toes have ſhort, broad, weak, flat nails, except the inner toe of the hind foot, which is provided with a flat crooked nail ſomewhat longer than the reſt; the ſoles of the feet are formed of fleſhy naked protuberances, divided by furrows. It lives moſtly about the mouths of caves or clefts in rocks; is gregarious; feeds entirely on vegetables; is mild, feeble, timid, and eaſily tamed, and has no voice or cry. Mr Bruce is of opinion, that this animal is the gannim or Daman Iſrael of the Arabs, and the ſaphan of ſacred ſcriptures, which has erroneouſly been tranſlated *the rabbit*.—Its fleſh is very white, but is not eaten by the Abyſſinians or Mahometans. The ſame celebrated traveller is of opinion that it ruminates or chews the cud."

MUSA, the plantain-tree: A genus of the monœcia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the eighth order, *Scitamineæ*. The calyx of the male hermaphrodite is a ſpatha or ſheath; the corolla is dipetalous; the one petal erect and quinquedentate; the other nectariferous, concave, and ſhorter; there are ſix filaments; five of which are perfect; one ſtyle; the germen inferior and abortive. The female hermaphrodite has the calyx, corolla, filaments, and piſtil of the male hermaphrodite, with only one filament perfect; the berry is oblong, and three-angled below. The moſt remarkable ſpecies are, 1. The *paradiſaica*, or plantain; 2. The *muſa ſapientum*, or banana-tree. See Plate CCCXX.

The firſt ſort is cultivated in all the iſlands of the Weſt Indies, where the fruit ſerves the Indians for bread; and ſome of the white people alſo prefer it to moſt other things, eſpecially to the yams and caſſada bread. The plant riſes with a ſoft ſtalk 15 or 20 feet high; the lower part of the ſtalk is often as large as a man's thigh, diminiſhing gradually to the top, where the leaves come out on every ſide;—theſe are often eight feet long, and from two to three feet broad, with a ſtrong fleſhy midrib, and a great number of tranſverſe veins running from the midrib to the borders. The leaves are thin and tender, ſo that where they are expoſed to the open air, they are generally torn by the wind: for as they are large, the wind has great power againſt them: theſe leaves come out from the centre of the ſtalk, and are rolled up at their firſt appearance; but when they are advanced above the ſtalk, they expand and turn backward. As theſe leaves come up rolled in the manner before-mentioned, their advance upward is ſo quick that their growth may almoſt be diſcerned by the naked eye; and if a fine line is drawn acroſs level with the top of the leaf, in an hour's time the leaf will be near an inch above it. When the plant is grown to its full height, the ſpikes of flowers will appear in the centre, which is often near four feet in length, and nods on one ſide. The flowers come out in bunches: thoſe in the lower part of the ſpike being the largeſt; the others diminiſh in their ſize upward. Each of theſe bunches is covered with a ſpath or ſheath of a fine purple colour, which drops off when the flowers open. The upper part of the ſpike is made up of male or barren flowers, which are not ſucceeded by fruit, but fall off with their covers. The fruit or plantains are about a foot long, and an inch and a half or two inches diameter: it is at firſt green, but when ripe of a pale-yellow colour. The ſkin is tough; and within is a ſoft pulp of a luſcious ſweet flavour. The pikes of fruit are often ſo large as to weigh upwards of 40 lb. The fruit of this ſort is generally cut before it is ripe. The green ſkin is pulled off, and the heart is roaſted in a clear fire for a few minutes; and frequently turned: it is then ſcraped, and ſerved up as Bread. Boiled plantains are not ſo palatable. This tree is cultivated on a very extenſive ſcale in Jamaica; without the fruit of which, Dr Wright ſays, the iſland would ſcarce be habitable, as no ſpecies of proviſion could ſupply their place. Even flour or bread itſelf would be leſs agreeable, and leſs able to ſupport the laborious negroe, ſo as to enable him to do his buſineſs or to keep in health. Plantains alſo fatten horſes, cattle, ſwine, dogs, fowls, and other domeſtic animals.

The leaves being ſmooth and ſoft are employed as dreſſings after bliſters. The water from the ſoft trunk is aſtringent, and employed by ſome to check diarrhœas. Every other part of the tree is uſeful in different parts of rural economy. The leaves are uſed for napkins and table cloths, and are food for hogs.

The ſecond ſort differs from the firſt, in having its ſtalks marked with dark purple ſtripes and ſpots.—The fruit is ſhorter, ſtraighter, and rounder; the pulp is ſofter, and of a more luſcious taſte. It is never eaten green; but when ripe it is very agreeable, either eaten raw or fried in ſlices as fritters; and is reliſhed by all ranks of people in the Weſt Indies.

Both the above plants were carried to the Weſt Indies from the Canary iſlands; whither, is believed, they had been brought from Guinea, where they grow naturally. They are alſo cultivated in Egypt, and in moſt other hot countries, where they grow to perfection in about 10 months from their firſt planting to the ripening of their fruit. When their ſtalks are cut down, there will ſeveral ſuckers come up from the root, which in ſix or eight months will produce fruit; ſo that by cuttting down the ſtalks at different times, there is a conſtant ſucceſſion of fruit all the year.

In Europe there are ſome of theſe plants preſerved in the gardens of curious perſons, who have hot houſes capacious enough for their reception, in many of whom they have ripened their fruit very well; but as they grow very tall and their leaves are large they require more room in the ſtove than moſt people care to allow them. They are propagated by ſuckers, which come from the roots of thoſe plants which have fruited; and many times the younger plants, when they are ſtinted in growth, will alſo put out ſuckers.

The fruit of the banana-tree is four or five inches long, of the ſize and ſhape of a middling cucumber, and of a high, grateful flavour: the leaves are two yards long, and a foot broad in the middle; they join to the top of the body of the tree, and frequently contain in their cavities a great quantity of water which runs out, upon a ſmall inciſion being made into the tree, at the junction of the leaves. Bananas grow in great bunches, that weigh a dozen pounds and upward. The body of the tree is ſo porous as not to merit the name of wood; the tree is only perennial by its roots, and dies down to the ground every autumn.

When the natives of the Weſt Indies (ſays Labat) undertake a voyage, they make proviſion of a paſte of banana; which, in caſe of need, ſerves them for nouriſhment and drink: for this purpoſe they take ripe bananas; and having ſqueezed them through a fine ſieve, form the ſolid fruit into ſmall loaves, which are dried in the ſun or in hot aſhes, after being previouſly wrapped up in the leaves of Indian flowering-reed.—When they would make uſe of this paſte they diſſolve it in water, which is very eaſily done; and the liquor, thereby rendered thick, has an agreeable acid taſte imparted to it, which makes it both refreſhing and nouriſhing.—The banana is greatly eſteemed, and even venerated, by the natives of Madeira, who term it the *forbidden fruit*, and reckon it a crime almoſt inexpiable to cut it with a knife; becauſe, after diſſection, it exhibits, as they pretend, a ſimilitude of our Saviour's crucifixion; and to cut the fruit open with a knife, is, in their apprehenſion, to wound his ſacred image.

Some authors have imagined, that the banana-tree was that of the leaves of which our firſt parents made themſelves aprons in Paradiſe. The ſacred text, indeed, calls the leaves employed for that purpoſe *fig-leaves*; and Milton, in a moſt beautiful but erroneous deſcription, affirms the bearded or Bengal fig to have been the tree alluded to. But beſides that the fruit of the banana is often by the moſt ancient authors called a *fig*, its leaves, by reaſon of their great ſize and ſolidity, were much more proper for a veil or covering than thoſe of the Bengal fig, which are ſeldom above ſix or eight inches long and three broad. On the other hand, the banana leaves being three, four, and five feet long, and proportionally broad, could not fail to be pitched upon in preference to all others; eſpecially as they might be eaſily joined, or ſewed together, with the numerous thread-like filaments that may, with the utmoſt facility, be peeled from the body of this tree.

Some have ſuppoſed the Abyſſinian plant *enſete* to be a ſpecies of muſa. It is ſaid to be a native of the province of Narea, where it grows in the great marſhes and ſwamps for which that province is remarkable, owing to the many rivers which originate in that country, and have but a ſmall declivity to the ocean. This plant, as well as the coffee-tree, is ſaid to have been unknown in Abyſſinia before the arrival of the Galla, who imported them both along with them. It comes to great perfection about Gondar; but the principal plantations of it are in that part of Maitſha and Gouth, to the weſt of the Nile, where it is almoſt the ſole food of the Galla who inhabit that country. Maitſha is almoſt entirely on a dead level; ſo that the rains ſtagnate and prevent the ſowing of grain. Were it not for the enſete, therefore, the Galla would have ſcarce any vegetable food. Mr Bruce * thinks that the enſete may have been cultivated in ſome of the gardens of Egypt about Roſetto, but that it was not a native of the country. He ſtrongly controverts the opinion that this plant is a ſpecies of muſa. "It is true (ſays he), the leaf of the banana reſembles that of the enſete: it bears figs, and has an excreſcence from its trunk, which is terminated by a conical figure, chiefly differing from the enſete in ſize and quantity of parts; but the figs of the banana are of the ſize and figure of a cucumber, and this is the part which is eaten. This fig is ſweet, though mealy, and of a taſte highly agreeable. It is ſuppoſed to have no ſeeds, though in fact there are four ſmall black ſeeds belonging to every fig. But the figs of the enſete are not eatable: they are of a ſoft tender ſubſtance: watery, taſteleſs, and in colour and conſiſtence reſembling a rotten apricot: they are of a conical form, crooked a little at the lower end; about an inch and an half in length, and an inch in breadth where thickeſt. In the inſide of theſe is a large ſtone half an inch long, of the ſhape of a bean or caſhew-nut, of a dark-brown colour; and this contains a ſmall ſeed, which is ſedom hardened into fruit, but conſiſts only of ſkin. The long ſtalk that bears the figs of the enſete ſprings from the centre of the plant, or rather is the body or ſolid part of the plant itſelf. Upon this, where it begins to bend, are a parcel of looſe leaves; then grows the fig upon the body of the plant without any ſtalk; after which the top of the ſtalk is thickſet with ſmall leaves, in the midſt of which terminates the flower in the form of an artichoke; whereas in the banana, the flower in form of the artichoke grows at the end of that ſhoot or ſtalk, which proceeds from the middle of the plant, the upper part of which bears the row of figs. The leaves of the enſete are of a web of longitudinal fibres cloſely ſet together; the leaves grew from the bottom without ſtalks; whereas the banana is in form like a tree, and has been miſtaken for ſuch. One half of it is divided into a ſtem, the other is a head formed with leaves; and in place of the ſtem that grows out of the enſete, a number of leaves, rolled round together like a truncheon, ſhoots out of the heart of the banana, and renews the upper as the under leaves fall off; but all the leaves of the banana have a long ſtalk; this fixes them to the trunk, which they do not embrace by a broad baſe or involucrum as the enſete does.

"But the greateſt differences are ſtill remaining.—The banana has by ſome been miſtaken for a tree of the palmaceous kind, for no other reaſon but a kind of ſimiliarity in producing the fruit on an excreſcence or ſtalk growing from the heart of the ſtem: but ſtill the muſa is neither woody nor perennial; it bears the fruit but once; and in all theſe reſpects it differs from trees of the palmaceous kind, and indeed from all ſorts of trees whatever. The enſete, on the contrary, has no naked ſtem; no part of it is woody: the body of it, for ſeveral feet high, is eſculent; but no part of the banana plant can be eaten. As ſoon as the ſtalk of the enſete appears perfect and full of leaves, the body of the plant turns hard and fibrous, and is no longer fit to be eaten: before, it is the beſt of all vegetables. When boiled, it has the taſte of the beſt new wheat-bread not perfectly baked. When you make uſe of the enſete for eating, you cut it immediately above the ſmall detached roots, and perhaps a foot or two higher, as the plant is of age. The green muſt be ſtripped from the upper part till it becomes white; when ſoft, like a turnip well boiled, if eat with milk or butter, it is the beſt of all food, wholeſome, nouriſhing; and eaſily digeſted."

Our author now proceeds to conſider an hieroglyphic ſometimes met with in Egypt, viz. "the figure of Iſis ſitting between ſome branches of the banana tree, as is ſuppoſed, and ſome handfuls of ears of wheat. You ſee likewiſe the hippopotamus ravaging a quantity of the banana tree. Yet the banana is merely adventitious in Egypt: it is a native of Syria: it does not even exiſt in the low hot country of Arabia Felix; but chooſes ſome elevation in the mountains where the air is temperate; and is not found in Syria farther to the ſouthward than Lat. 34°.

For theſe reaſons Mr Bruce thinks, that the banana not being a plant of the country, "could never have entered into the liſt of their hieroglyphics; for this reaſon it could not figure any thing regular or permanent in the hiſtory of Egypt or its climate. I therefore imagine (adds he), that this hieroglyphic was wholly Ethiopian; and that the ſuppoſed banana, which, as an adventitious plant, ſignified nothing in Egypt, was only a repreſentation of the enſete; and that the record in the hieroglyphic of Iſis and the enſete-tree was ſomething that happened between harveſt, which was about Auguſt, and the time that the enſete-tree came in uſe, which was in October.—The hippopotamus is generally thought to repreſent a Nile that has been ſo abundant as to be deſtructive. When, therefore, we ſee upon the obeliſks the hippopotamus deſtroying the banana, we may ſuppoſe it meant, that the extraordinary inundation had gone ſo far as not only to deſtroy the wheat, but alſo to retard or hurt the growth of the enſete, which was to ſupply its place."

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* Travels, vol. v. p. 36.

MUSÆUS, an ancient Greek poet, was, according to Plato and Diodorus Siculus, an Athenian, the ſon of Orpheus, and chief of the Eleuſinian myſteries inſtituted at Athens in honour of Ceres: or, according to others, he was the only the diſciple of Orpheus: but from the great reſemblance which there was between his character and talents and thoſe of his maſter, by giving a ſtronger outline to the figure he was called his *ſon*, as thoſe are ſtyled the *children of Apollo* who cultivated the arts of which he was the tutelar god.

Muſæus is allowed to have been one of the firſt poets who verſified the oracles. He is placed in the Arundelian marbles, epoch 15. 1426 B. C. at which time his hymns are there ſaid to have been received in the celebration of the Eluefinian myſteries. Laertius tells us, that Muſæus not only compoſed a theogeny, but formed a ſphere for the uſe of his companions; yet as this honour is generally given to Chiron, it is more natural to ſuppoſe, with Sir Iſaac Newton, that he enlarged it with the addition of ſeveral conſtellations after the conqueſt of the golden fleece. The ſphere itſelf ſhows that it was delineated after the Argonautic expedition, which is deſcribed in the aſteriſms, together with ſeveral other more ancient hiſtories of the Greeks, and without any thing later; for the ſhip Argo was the firſt long veſſel which they had built: hitherto they had uſed round ſhips of burthen, and kept within ſight of the ſhore; but now, by the dictates of the oracle, and conſent of the princes of Greece, the flower of that country ſail rapidly through the deep, and guide their ſhip by the ſtars.

Burney's History of Muſic.

Muſæus is celebrated by Virgil in the character of hierophant, or prieſt of Ceres, at the head of the moſt illuſtrious mortals who have merited a place in Elyſium. Here he is made the conductor of Æneas to the receſs where he meets the ſhade of his father Anchiſes.

A hill near the citadel of Athens was called *Muſæum*, according to Pauſanias, from Muſæus, who uſed to retire thither to meditate and compoſe his religious hymns; at which place he was afterwards buried. The works which went under his name, like thoſe of Orpheus, were by many attributed to Onomacritus. Nothing remains of this poet now, nor were any of his writings extant in the time of Pauſanias, except a hymn to Ceres, which he made for the Lycomides. And as theſe hymns were likewiſe ſet to muſic, and ſung in the myſteries by Muſæus himſelf in the character of prieſt, he thence perhaps acquired from future times the title of *muſician* as well as of *poet*; the performance of ſacred muſic being probably at firſt confined to the prieſthood in theſe celebrations, as it had been before in Egypt, whence they originated. However, he is not enumerated among ancient muſicians by Plutarch; nor does it appear that he merited the title of *ſon* and *ſucceſſor to Orpheus* for his muſical abilities, ſo much as for his poetry, piety, and profound knowledge in religious myſteries.

MUSCA, the FLY, in zoology; a genus of inſects belonging to the order of diptera. The mouth is furniſhed with a fleſhy proboſcis, and two lateral lips; but it has no palpi. This genus is divided into two different ſections: 1. Thoſe with ſimple antennæ. 2. Thoſe which are furniſhed with a lateral hair or feather. Thoſe have downy bodies, though ſcarce perceptibly ſo; and have either a lateral plume or feather on the antennæ, or a ſimple hair on the ſide of the antennæ. The piloſæ have a few hairs ſcattered upon their bodies, principally upon the thorax; they have either a lateral feather or a lateral hair. Under these divisions are comprehended about 400 different ſpecies, as enumerated in Dr Gmelin's edition of the *Syſtema Naturæ*. "Variety (as Mr Barbut obſerves) runs through their forms, their ſtructure, their organization, their metamorphoſes, their manner of living, propagating their ſpecies, and providing for their poſterity. Every ſpecies is furniſhed with implements adapted to its exigencies. What exquiſiteneſs! what proportion in the ſeveral parts that compoſe the body of a fly! What preciſion, what mechaniſm in the ſprings and motion! Some are oviparous, others viviparous; which latter have but two young ones at a time, whereas the propagation of the former is by hundreds. Flies are laſcivious troubleſome inſects, that put up with every kind of food. When ſtorms impend, they have moſt activity, and ſting with greateſt force. They multiply moſt in hot moiſt climates; and ſo great was formerly their numbers in Spain, that there were fly-hunters commiſſioned to give them chace. The vapour of ſulphur or arſenic deſtroys them; and their numbers may be reduced by taking them in phials of honeyed water, or between boards done over with honey." There are 129 ſpecies, principally diſtinguiſhed by the peculiarities in their feelers.

MUSCA, a name given to ſuch perſons among the Romans as officiouſly thruſt themſelves into the company of their ſuperiors and thoſe who deſpiſed them, by finding means of getting admittance to entertainments without invitation, and without a welcome: So that *muſcæ* were the ſame as paraſites, who were frequently by the Greeks termed Μυιαι. See PARASITE.

MUSCADINE, a rich wine, of the growth of Provence, Languedoc, Cividad, &c.—The word, as well as the liquor, is French: Some fetch its original from the *muſk*; the wine being ſuppoſed to have a little of the ſmell of that perfume; others from *muſca*, a fly," becauſe the flies are extremely fond of its grapes; as the Latins had their *vinum apianum*, ſo called *ab apibus*, from the bees which fed on it.

The way of making muſcadine at Frontignac is as follows: They let the muſcadine grapes grow half dry on the vine; as ſoon as they are gathered, they tread and preſs them immediately, and tun up the liquor, without letting it ſtand and work in the fat; the lee occaſioning its goodneſs.

MUSCHENBROECK (Peter de), a very diſtinguiſhed natural philoſopher and mathematician, was born at Utrecht a little before 1700. He wat firſt profeſſor of theſe in his own univerſity, and afterwards invited to the chair at Leyden, where he died full of reputation and honours in 1761. He was a member of ſeveral academies; particularly the Academy of Sciences at Paris. He was the author of ſeveral works in Latin, all of which ſhow the greateſt penetration and exactneſs in this way. He was alſo very conſummate in the knowledge of law.

MUSCI, MOSSES, one of the ſeven families or claſſes into which all vegetables are divided by Linnæus in the *Philoſophia Botanica*. The ancients took the moſs of trees to be the effect of a diſorder or diſcompoſure of the texture of the bark; or at moſt a kind of little filaments ariſing from the bark; but the moderns find, by ſeveral obſervations, that moſſes are all real diſtinct plants, whoſe ſeed, being extremely ſmall, is incloſed in little capſulæ; which burſting of themſelves, the ſeed is carried off by the winds; till, falling into the inequalities of the bark of trees, it is there ſtopped, takes root, and feeds at the expence of the tree, as mouldineſs does on bread, &c.

What the botanical writers ſtrictly underſtand by the word *moſs*, is a claſs of plants appearing of an inferior rank to the common vegetables; the leſs perfect genera of which have been ſuppoſed to be wholly deſtitute of flower or ſeed, or any thing analogous to either, and to conſiſt of ſimple, ſimilar, and uniform parts; the genera a little above theſe have ſome diverſity of parts, and carry ſomething that looks analogous to vegetation in the common way, having a reſemblance of thoſe parts which ſerve other plants for their fructification. The more perfect genera of the moſſes not only conſiſt of different parts, but have alſo their appropriated organs containing a pulpy matter, which finally becomes dry, and aſſumes the form of a fine and ſubtile powder, compoſed of granules, each of which is either a ſeed or a granule of farina, ſerving for the propagation of the ſpecies.

The more imperfect moſſes are diſtinguiſhed from the others by their appearance to the naked eye; they are either in form of a fine lanugo or down covering the ſurface of different bodies; or elſe they appear as ſlender filaments, or foliaceous bodies, floating about in the water; or as filaments of a tougher texture, hanging down from the branches of old trees; or as little ſhrubs, or ſingle horns, growing erect on the parched earth of mountains and heathy places; or finally, as broad and foliaceous bodies ſpreading themſelves over the dry barks of trees or rocks, without any pedicle or other ſuppport.

The more perfect kinds of moſſes are found in the ſhape of ſmall but regular plants, divided into ſeveral branches, and clothed with leaves: theſe are of various forms and ſtructures; ſome being broad and thin, others ſlender as hairs; ſome pellucid, others opake; ſome ſmooth, others hairy. From the alæ of theſe leaves in ſome kinds, and from the ſummit of the ſtalks in others, there ariſe heads or capſules of various figure and ſtructure, but all unicapſular; ſome of theſe are naked, and others covered with a calyptra or hood; ſome ſtand on long pedicles, and others are placed cloſe to the ſtalks. Theſe heads are uſually called *capſulæ*, which contain their ſeeds or farina, and their pedicles *ſetæ*, in the *mnia*, *hypna*, *brya*, and *polytricha*, &c.

Theſe capſules in ſome are covered with a calyptra or hood; in others they are naked. Of the firſt kind are the *ſplachnum*, *polytricum*, *mnium*, *bryum*, *hypnum*, *fontinalis*, and *buxbaumia;* and of the latter ſort, the *lycopodium*, *porella*, *ſphagnum*, and *phaſcum*.

The ſubſtance with which the heads or capſules of all the moſſes are filled, reſembles either ſeeds, or the ſmall globules of the farina of flowers, which all reſemble ſeeds of particular figures in miniature. The fructifications of theſe minute plants ſeem to be either from theſe, as ſeeds falling to the earth; or, according to the opinion of ſome, they ſeem to contain only farina in the capſules, which impregnating certain bulbs or nodules in the alæ of the leaves, cauſe them to grow and vegetate, as is ſeen in ſome of the larger plants; as in the bulbs produced in the alæ of the leaves of the dentaria, and of the lilies, and ſome others. The former opinion, of the powder in the heads or capſules being actually perfect ſeeds, is the more probable, as the bulbs in the alæ of the leaves are found only in ſome of the hypna, and others of a few other genera; whereas the propagation is as quick and certain in thoſe which have none of them as in thoſe which have; and the want of female parts of fructification, which makes ſo many deſiderata in the Linnæan ſyſtem of botany, is eaſily made up, and the whole explained according to the uſual courſe of nature in other vegetables, by allowing the powder in the capſules to be real ſeeds, and the ſmall globules on the pointals ſurrounding the aperture of the capſule, the farina.

The opinion of the moſſes growing from theſe nodules in the alæ of the leaves, or from the impregnated ends of the branches which had received the powder from the capſules, was originally founded on the obſerving that the trailing or branched hypna annually grew out in length, from the extremities of all their branches, and annually loſt as much of the old ſtalk at the root as they gained of the new at the ſummit; but it appears from farther obſervations, that they are real ſeeds which are contained in form of powder in the capſules; ſince the brya, and many others, are found growing from ſmall points or ſpots, which are aſſemblages of their minute leaves, propagated on the ground, under the old ones juſt where the powder of the capſules has fallen; and though it be allowed that the hypna and other trailing moſſes do grow from the ends of the branches, yet they may alſo be produced in form of new plants, from regular and perfect ſeeds ſhed from the capſules. It is certain that the brya are by this means propagated and ſpread into large tufts, and the other genera may alſo be ſo propagated, though they have beſide a property of increaſing by growth of the ſtalk; which ſeems no other than the property of many of the large plants to creep at the root, and ſhoot out in length greatly from the extremities of their horizontal branches, lying on or under the ground, as thoſe ſpreading parts may more properly be ſo called than roots, the fibres puſhed out from them perpendicularly into the earth being properly the roots; and it is well known that theſe plants, though they propagate themſelves thus by the root, they produce ſeed alſo like others, by which they may be equally propagated: and this analogy is to be carried yet farther; for as thoſe plants which creep by the roots produce fewer ſeeds than thoſe which are propagated only by ſeeds; ſo the hypna, which are the genus of moſſes in which this growth by the ſtalk is principally obſerved, are very thinly beſet with capſules of ſeed, and many of them produce but very few in a ſeaſon; whereas the brya, and other moſſes which have not this advantage of growing from the ends of the ſtalks, are found every year profuſely covered with capſules from every tuft; nay, there is ſcarce any branch which does not produce its capſule. Now, if theſe capſules contained only a farina capable of impregnating the nodules or the ends of the branches, it is obvious there would be as much of it required for the hypna as for any other kinds of moſſes; but if they are real and perfect ſeeds, it is no wonder that nature has given them profuſely to ſuch kinds as are to be propagated only by ſeeds, and more ſparingly to thoſe which are propagated alſo by the increaſe of the branches.

To this it may finally be added, that the ferns and other epiphylloſpermous plants approach moſt of all others to the nature of the moſſes; and though it has been ſuſpected by many that the fine powder at the back of their leaves was not ſeeds, but only a farina, yet it is now well known that it is true and perfect ſeed; ſince, under many ſpecies of them, there are conſtantly found new and ſelf-ſown plants ariſing in their firſt rudiments of leaves and figure, which have plainly grown from the duſt or powder fallen from the old plants; and as this is now found to be the caſe in regard to the ferns, probably it will alſo appear the ſame in regard to moſſes, when they have been yet farther examined than at preſent. But whether theſe grains of powder have the lobes and radicles by which the ſeeds of larger plants propagate themſelves, or whether they grow into plants like the parent ones, in the manner of the lichens, by mere expanſion, is a thing that requires farther obſervation to determine.

Some of the moſſes, it is evident, approach to the nature of the plants which have their male and female parts in the ſame flower, and others to thoſe which have them in different ones.

After all, this tribe of plants, as well as the muſhrooms, ferns, and ſea-weed, is ſtill imperfectly known. Dillenius, profeſſor of botany at Oxford, was the firſt who attempted an arrangement of them. In his *Catalogus Plantarum circa Giſſam*, publiſhed at Francfort in 1719, and afterwards in his *Hiſtoria Muſcorum*, publiſhed at Oxford in 1741, he divides the moſſes into 16 genera. This arrangement, however, includes the lichens, ſome of the fuci, and other plants which belong to very different families. The work in queſtion is, notwithſtanding, valuable, in having introduced the knowledge of upwards of 200 plants, which were unknown before Dillenius; it is, beſides, of all his works of this kind, the beſt executed, both for the deſcriptions and figures, and ſhould ſerve as a model to ſuch authors as intend to publiſh in detail the hiſtory of any particular family of plants.

Micheli, in a work intitled *Nova Plantarum Genera*, publiſhed at Florence in folio in 1629, divides the moſſes into two ſections, from the figure and ſituation of their flowers. Theſe ſections comprehend together 16 genera, amongſt which are improperly arranged, like theſe of Dillenius, ſeveral of the lichens and other ſea-weed.

The diſcovery of the ſeeds of the moſſes, though made by Dillenius in 1719, is arrogated by Linnæus to himſelf, who did not begin to write till 1735.

In Ray's method, the moſſes form the third claſs: in Tournefort's, they continue a ſingle genus, by the name of *muſcus*, in the firſt ſection of the 17th claſs, which comprehends the moſſes, muſhrooms, and ſome of the algæ or ſea-weed, and is diſtinguiſhed by the name of *aſpermæ*, or plants without ſeed; the ſeeds of the moſſes not having been detected by Tournefort.

The characteriſtics of theſe plants, according to the ſexual ſyſtem, are, 1. Tops without filaments or threads. 2. The male flower, conſtituted by the preſence of the *antheræ* or tops, placed apart from the female, either on the ſame or diſtinct roots. 3. The female flowers deprived of the *piſtillum* or pointal. 4. The ſeeds devoid of both lobes *(cotyledones)* and proper coverings; ſo that they exhibit the naked embryo.

In the ſame ſyſtem, theſe plants conſtitute the ſecond order of the claſs *cryptogamia*, which contains all the plants in which the parts of the flower and fruit are wanting, or not conſpicuous. This order is ſubdivided into 13 genera, from the preſence or abſence of the calyx, which in theſe plants is a veil or cover like a monk's cawl, that is placed over the male organs or tops of the ſtamina, and is denominated *calyptra*, from the ſexes of the plants, which bear male and female flowers, ſometimes on the ſame, ſometimes on diſtinct roots; and from the manner of growth of the female flowers, which are ſometimes produced ſingly, ſometimes in bunches or cones. Theſe diſtinctions are moſtly borrowed from Dillenius, whoſe excellence in developing this part of the vegetable kingdom Linnæus very readily acknowledges.

The manner of feeding of moſſes in general may be more clearly underſtood from the deſcription of that genus of them which has been traced through all its ſtages, and to which moſt of the others, though every genus has its diſtinct fructification in ſome reſpects, yet bear a very great general analogy.

The genus already obſerved, is that called by Dr Dillenius the *hypnum*. The ſpecies of this are very numerous and common; but that particular one which was the ſubject of theſe obſervations, is the ſhort branched ſilky kind, common on old walls; and called by that author in his hiſtory *hypnum, vulgare, ſericum, recurvum, capſulis erectis cuſpidatis*.

The head of this moſs appears to the naked eye a ſmall, ſmooth, browniſh-yellow, oblong body, of about a ninth of an inch long; this is covered at its upper end with a membranaceous calyptra or hood, in ſhape reſembling an extinguiſher or a funnel inverted. When this calyptra is taken off, and the head viewed with a microſcope, the ſurface of it is ſeen to be ridged with longitudinal ſtriæ. The baſis of the head is of a deep orange colour, and more opaque than the reſt; and the top is bounded by an orange-coloured ring, ſwelling out ſomething beyond the ſurface of the contiguous parts of the head. Good glaſſes ſhow that in this head there are not wanting the parts eſſential to the fructification of what are uſually called the more perfect plants. This ring is truly a monophyllous undulated calyx, within which ariſe ſixteen pyramidal fimbriated ſtamina; theſe are of a pale greeniſh colour, and are loaded with a whitiſh oval farina. The ſtamina all bend toward each other from their baſes, and almoſt meet in a point at the tops. This is their appearance when the head is nearly ripe; and immediately under the arch formed by theſe ſtamina, is a cylindric hollow piſtillum, through which the farina makes its way, and is diſperſed among the ſeeds in the head; the fruit is a large capſule, filling every part of the membrane which ſhows itſelf on the outſide of the head, and in moſt places is contiguous to it; this capſule is filled with perfect and very beautiful ſeeds; they are round, tranſparent when unripe, but afterwards opaque, and of a very beautiful green, which colour they retain even when dried.

When this head is firſt produced from the plant, the ſtaminæ are very ſlender, and ſtand erect; the head is ſcarce any thicker than the ſtalk, and the calyptra covers it all over, to ſhield the tender ſubſtance of the farina from external injury. As the farina afterwards ſwells in the ſtamina, the ſeeds in the head increaſe alſo in bulk, and by their increaſe the head is more extended in thickneſs; and the ſtamina are by this means ſeparated farther and farther from each other at their baſes, but bend inwards toward their points, ſo as to form a kind of arched covering over the ſtigma of the piſtillum, which is ſingle; and from hence the farina falls as it ripens into the head, and impregnates the ſeeds.

The 11 principal genera are as follow: *Lycopodium, polytricum, bryum, ſelagines, uſneæ, mnium, byſſi, ſphagnum, hypna, conſervæ*, and *fontinalis*. Theſe are found growing on the barks of trees as well as on the ground. See Plates CCCXXI and CCCXXII.

Moſſes, by the inconſiderate mind, are generally deemed an uſeleſs or inſignificant part of the creation. That they are not, is evident from hence; that He who made them has made nothing in vain, but on the contrary has pronounced all his works to be very good Many of their uſes we know; that they have many more which we know not, is unqueſtionable, ſince there is probably no one thing in the univerſe of which we dare to aſſert that we know all their uſes. Thus much we are certain of with reſpect to moſſes, that as they flouriſh moſt in winter, and at that time cover the ground with a beautiful green carpet, in many places which would be otherwiſe naked, and when little verdure is elſewhere to be ſeen; ſo at the ſame time they ſhelter and preſerve the ſeeds, roots, gems, and embryo plants of many vegetables, which would otherwiſe periſh; they furniſh materials for birds to build their neſts with; they afford a warm winter's retreat for ſome quadrupeds, ſuch as bears, dormice, and the like, and for numberleſs inſects, which are the food of birds and fiſhes, and theſe again the food or delight of man. Many of them grow on rocks and barren places, and rotting away, afford the firſt principles of vegetation to other plants, which could never elſe have taken root there. Others grow in bogs and marſhes, and by continual increaſe and decay fill up and convert them either into fertile paſtures, or into peat-bogs, the ſource of inexhauſtible fuel to the polar regions.—They are applicable alſo to many domeſtic purpoſes; the lycopodiums are ſome of them uſed in dyeing of yarn, and in medicine; the ſphagnum and polytrichum furniſh convenient beds for the Laplanders; the hypnums are uſed in tiling of houſes, ſtopping crevices in walls, packing up of brittle wares and the roots of plants for diſtant conveyance.—To which may be added, that all in general contribute entertainment and agreeable inſtruction to the contemplative mind of the naturaliſt, at a ſeaſon when few other plants offer themſelves to his view.

Musci, is likewiſe the name of the 56th order in Linnæus's Fragments of a natural Method. See Botany, p 470.

MUSCICAPA, or Fly-catcher, a genus of birds belonging to the order of paſſeres. The bill is flatted at the baſe, almoſt triangular, notched at the upper mandible, and beſet with briſtles; the toes (generally) divided as far as their origin.

1. The griſola, or ſpotted fly-catcher, is about five inches and three quarters long. The head is large of a browniſh hue ſpotted obſcurely with black; the back is of a mouſe-colour: the wings and tail are duſky: the breaſt and belly white; the throat and ſides under the wings daſhed with red: the legs and feet are ſhort and black. It is a bird of paſſage; appears in England in the ſpring, breeds there, and departs in September. It builds its neſt againſt any part of a tree that will ſupport it; often in the hollow cauſed by the decay of ſome large limb, hole in a wall, &c. alſo on old poſts and beams of barns; and is found to return to the ſame place ſeaſon after ſeaſon. It lays four or five pale eggs marked with reddiſh. It feeds on inſects, and collects them on the wing. When the young can fly, the old ones withdraw with them into thick woods, where they frolic among the top branches; dropping from the boughs frequently quite perpendicularly on the flies that ſport beneath, and riſing again in the ſame direction. It will alſo take its ſtand on the top of ſome ſtake or poſt, from whence it ſprings forth on its prey, returning ſtill to the ſame ſtand, for many times together. They feed alſo on cherries, of which they ſeem very fond.

2. The pondiceriana, Pondicherry or Coromandel fly-catcher, is rather bigger than a ſparrow. The general colour of the upper parts is a cinereous grey: the throat, breaſt, and belly, white: the legs black. It inhabits the coaſt of Coromandel; where, from the agreeableneſs of its ſong, it is called the *Indian nightingale*.

3. The flabellifera or fan-tailed fly-catcher, is in length ſix inches and a half: the head is black, which colour deſcends on the back part lower than the nape, whence it paſſes forward in a narrow collar to the throat; the chin, throat and ſides of the neck, except where this collar paſſes, are white; and over the eye is a white ſtreak like an eye-brow: the upper parts of the body are olive-brown; the under parts yellowiſh ruſt, growing whitiſh towards the vent: the tail is longer than the body; the two middle feathers black, the others white: the legs are duſky. This ſpecies inhabits the ſouth iſle of New Zealand; where it is ſeen conſtantly hunting after inſects, and flies always with its tail in ſhape of a fan. It is eaſily tamed; and will then ſit on any perſon's ſhoulder, and pick off the flies. It has a chirping kind of note; and is called by the natives *Diggo-wagh-wagh*. There is a beautiful figure of this bird in Mr Latham's Synopſis, plate xlix.

4. The caribonenſis, or cat-bird, is ſomewhat bigger than a lark: length eight inches. Bill black: the upper parts of the body and wings are of a deep brown; the under aſh-coloured; the crown of the head is black; the tail is blackiſh, and the legs are brown. This ſpecies is found in Virginia in the ſummer-ſeaſon: where it frequents ſhrubs rather than tall trees, and feeds on inſects: its cry reſembles that of a cat, whence the Engliſh name given it by Cateſby. See Plate CCCXX. fig. 1.

5. The crinita, or creſted fly-catcher, is about the ſize of a lark: the head is creſted, and of a dull green: the hind part of the neck and back are of the ſame colour; the under parts from the chin to the breaſt

of an aſh-colour, and from thence to the vent yellow: the legs are black. This inhabits Carolina and Virginia in ſummer; builds there, and departs in autumn.

Fig. 3.

6. The rubricollus, purple throated fly-catcher, is about the ſize of a black-bird; the whole plumage is black; except the chin, throat, and fore part of the neck, on which is a large bed of beautiful crimſon, inclining to purple: the legs are black.—Theſe birds inhabit Cayenne and other parts of South America; where they are found in flocks, and precede in general the toucans in their movements. They feed on fruits and inſects; and are lively birds, always in action. They for the moſt part frequent the woods, like the toucans; and where the firſt are found the others are ſeldom far off.

7. The rubra, or ſummer red-bird of Cateſby, is a moſt beautiful ſpecies, ſomewhat bigger than a ſparrow: the bill is yellowiſh; the eyes are black; the legs duſky; the male is wholly of a ſcarlet colour, except the tips of the quill-feathers, which are of a duſky red: the colour of the female is brown tinged with yellow. It inhabits Carolina and Virginia in the ſummer.

This is a very numerous genus: there being about 90 other ſpecies deſcribed by authors. In the *Syſt. Nat.* (Gmelin), the whole number is 92; in Mr Latham's *Index Ornithologicus*, 62 are enumerated.

MUSCLE, in anatomy. See ANATOMY, Part II. ſect. ii.

The motion of the muſcles of animals has been thought a matter of ſuch curioſity and importance, that an annual lecture upon it was founded by Dr Croone, one of the original members of the Royal Society at London. In conſequence of this the inveſtigation of the ſubject hath exerciſed the pens of a great number of very learned and ingenious men; notwithſtanding which it ſtill remains involved in almoſt as much obſcurity as ever. Many curious obſervations, however, have been made; and as far as the laws of dead mechaniſm can be applied to a *living* machine, the inveſtigators have been ſucceſsful; but ſtill there has been a *ne plus ultra*, a certain barrier by which their inveſtigations have been limited, which no perſon has hitherto been able to paſs, and which it is very improbable ever will be paſſed. To give an account of all the different theories which have appeared on this ſubject is impoſſible; but in the year 1788 a lecture on this ſubject was delivered by Dr Blane, F. R. S. of which, as it ſeems to contain the ſubſtance of all that can be ſaid upon the ſubject, we ſhall here give the following abridgement.

The doctor conſiders as muſcles not only thoſe large maſſes of fleſh which compoſe ſo great a part of the bulk of the body, but likewiſe all the minuter organs ſubſervient to circulation, nutrition and ſecretion; ſince not only the heart itſelf, but the whole vaſcular ſyſtem and the inteſtines, owe their action to certain powers of irritability and contractility peculiar to muſcular fibres.

The firſt and moſt obvious conſiderations with reſpect to the muſcles is the regular organization of their fibres in a parallel direction. In this they are diſtinguiſhed from every other matter of a fibrous ſtructure, whether vegetable or mineral, by a certain degree of moiſture, tenacity, and elaſticity, entirely peculiar to themſelves.

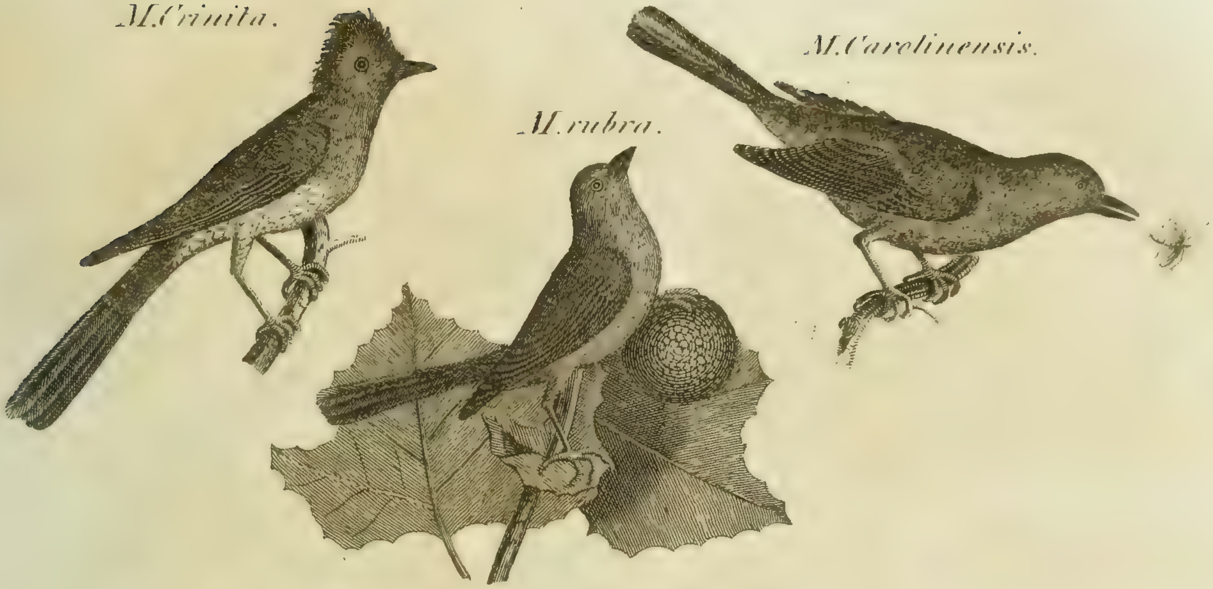
The fibres of the muſcles viſible to the naked eye are compoſed of others diſcoverable by glaſſes, and theſe others of fibres ſtill ſmaller; neither hath any perſon been able to diſcover the ultimately fine fibres of a muſcle, which are not compoſed of others. Some have indeed imagined that they have been able to do this, but their obſervations have been found fallacious; and it is now univerſally allowed that the fibres are diviſible beyond what the beſt aſſiſted ſight can trace, and that they are to all appearance uniform. In this regular and fibrous organization they reſemble the cryſtals of ſalts, many of which are found compoſed of fibres more and more fine, and which, like thoſe of the muſcles, can never be ultimately traced.

The doctor next touches a little upon the *vis inertiæ* of matter; and, contrary to the generally received opinion of modern philoſophers, conſiders matter as an active ſubſtance. What is called the *vis inertiæ*, he thinks, "is not a reſiſtance of change from reſt to motion, or from motion to reſt, but a reſiſtance to acceleration or retardation, or to change of direction." The activity of matter is further proved by the attractions and repulſions which take place univerſally among its parts; and every inſtance of motion within the cognizance of our ſenſes, may be referred, either in itſelf or its cauſe, to ſome mode of attraction or repulſion. Theſe may both be conſidered as one principle, being both expreſſive of that ſtate of activity originally inherent in matter; and becauſe any two particles, having affinity with each other, muſt either attract or repel, according to their diſtance, their common temperature, and other circumſtances; and it is ſo univerſal an agent in nature, that ſome modern philoſophers have made it abſorb, as it were, every other power and property in matter. It is evident, however, whether this hypotheſis be juſt or not, that the cauſe of muſcular motion cannot be referred to mechaniſm, which is itſelf only a ſecondary principle. Some have had recourſe to a fluid conveyed into the fibres of muſcles, by which they were ſwelled, and thereby ſhortened. One of the moſt plauſible of theſe hypotheſes ſuppoſes this fluid to be the blood; but this is plainly *a petitio principii*: for in order to ſet the blood in motion, muſcular motion is neceſſary. Other fluids have been ſuppoſed to have this effect; but even the exiſtence of theſe has not been proved, and indeed the moſt ſolid objections might be brought againſt all the theories that have hitherto been invented.

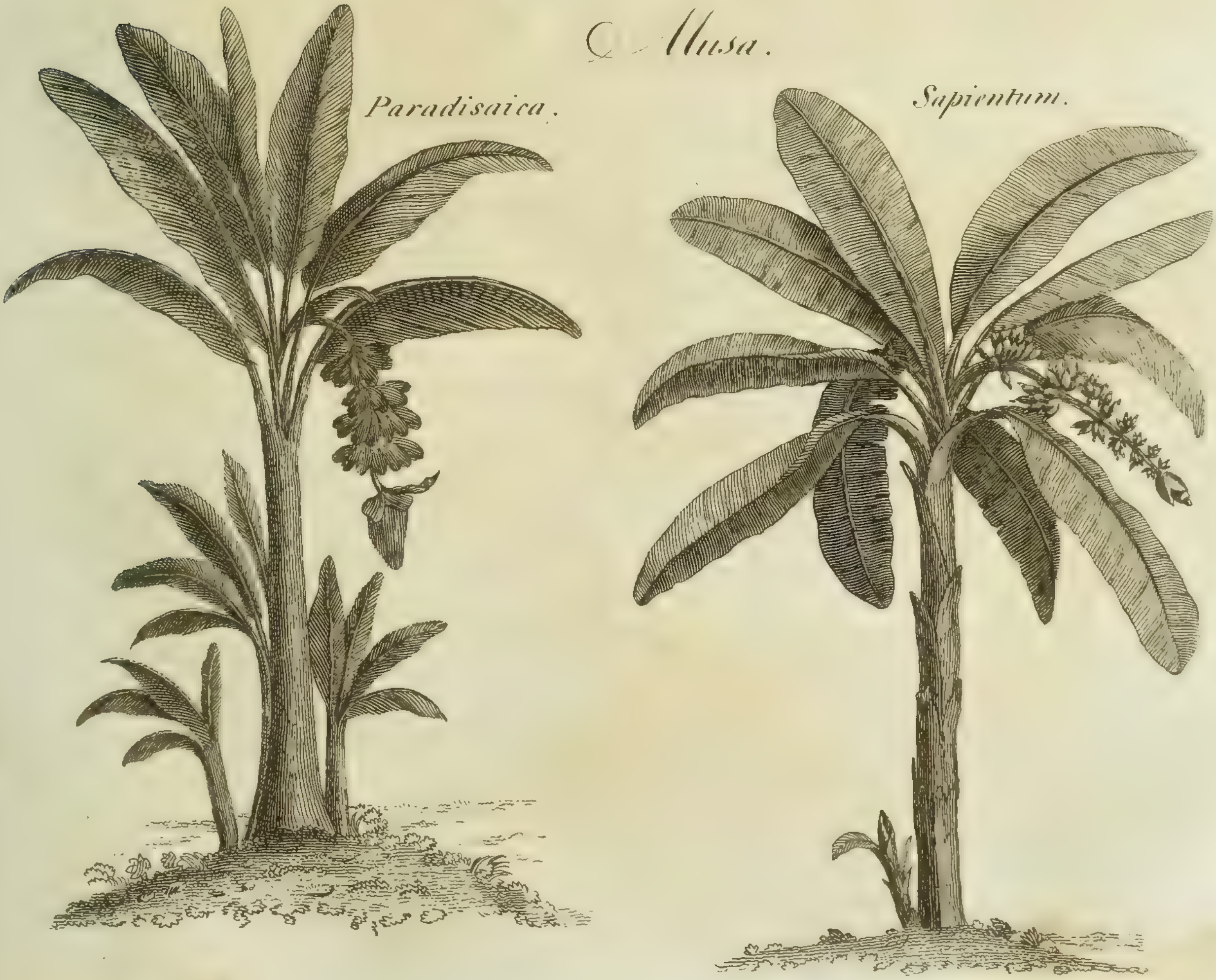
Our author having now eſtabliſhed it as a maxim, that the primary properties of matter, are attraction and repulſion, and that mechaniſm is only a ſecondary property, he next conſiders muſcular motion as referable to an original law of animated matter, whereby its particles are endowed with an attractive power, for which no cauſe can be aſſigned any more than for gravitation, coheſion, or chemical affinity. If the ſhortening of a muſcular fibre depends on this increaſed power of attraction between its particles, the effect will be to add to the power of coheſion in the fibre; and to determine this the Doctor made the following experiment: Having taken the flexor muſcule of the thumb of a man newly dead while yet warm and flexible,

Plate CCCXX.

Muscicapa.

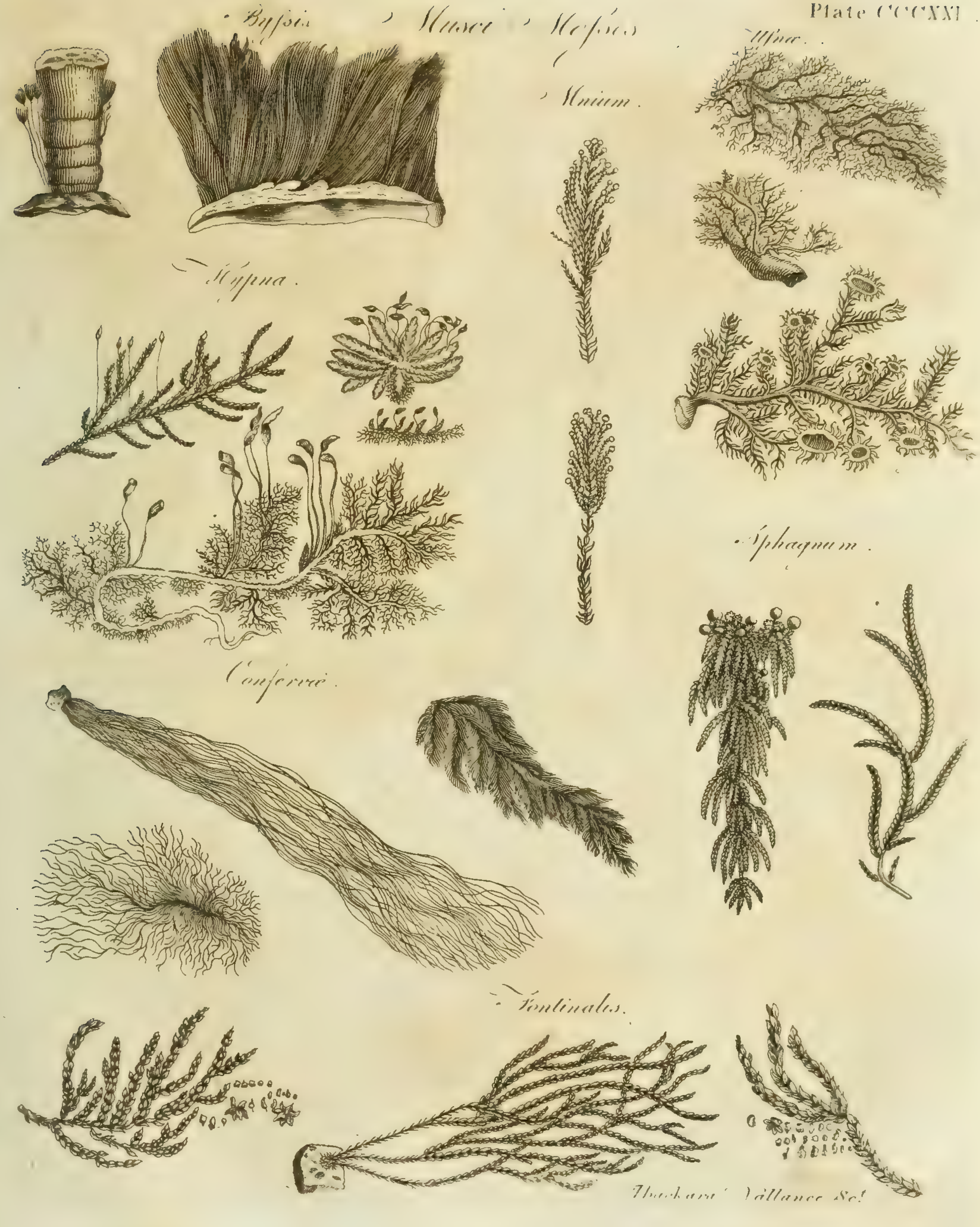

M.Crinita.
M.Carolinensis.
M.rubra.

Musa.



Thackara & Vallance Sculpt.

Plate CCCXXI.

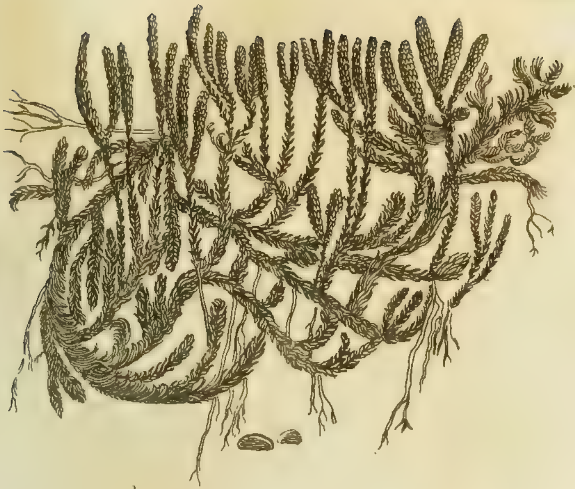


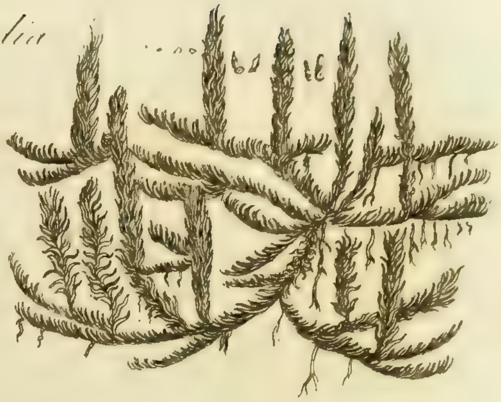
Thackara Vallance Sc.

Musci. Mosses

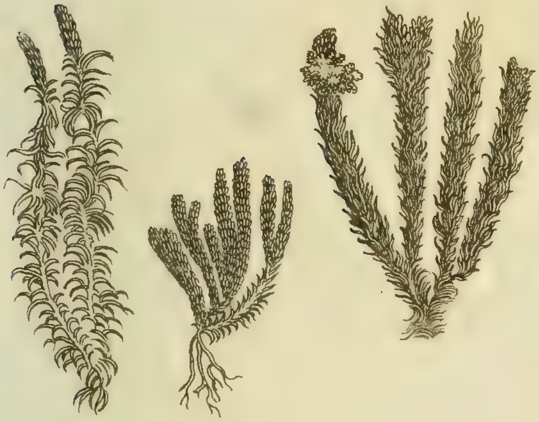
Plate CCCXXII

Lycopodia

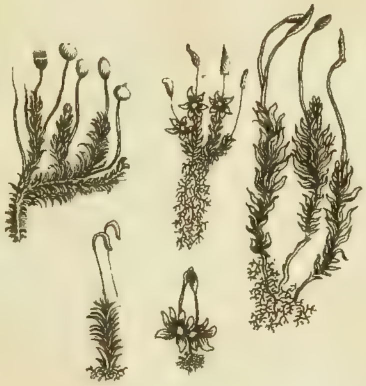




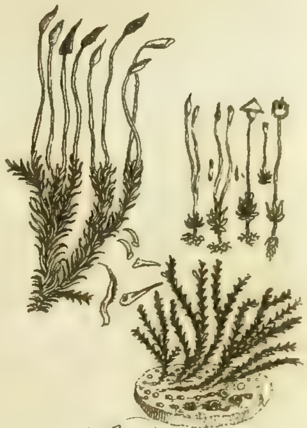
Selagines.



Brya.

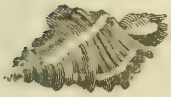


Polytricha.



Murex.

N.° 1



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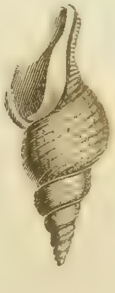

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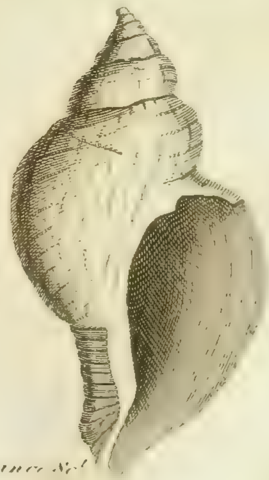
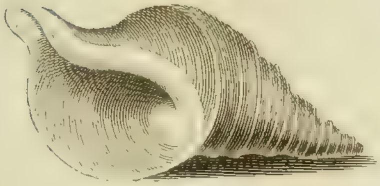


N.° 2



Thackara & Vallance Sc.

ible, he appended a weight to it, continually augmenting it until the muſcle broke; and this he found was done when 26 pounds had been added: yet a living man of the ſame apparent ſtrength and age could with eaſe lift a weight of 38 pounds by the exertions of the ſame muſcle. "It is farther in proof of this fact (adds he), that in the caſe of a violent ſtrain from muſcular contraction in the living body, it is the tendon that gives way; whereas we have ſeen that in the dead body the muſcle is the weaker of the two. It is alſo well known, that in caſes of our exertion the muſcular fibres themſelves do not give way, though the ſtrongeſt tendons, ſuch as the tendo Achillis, and even bones, ſuch as the knee-pan, are broke by their living force, which in ſuch inſtances muſt be many times greater than the ſtrength of the dead fibres. There is a caſe related in the Philoſophical Tranſactions by Mr Amyand, wherein the os humeri was broken by an exertion of the muſcles. Every one has heard of fractures happening from very ſlight accidents. Theſe occur moſt probably from a jerk of the muſcles concurring with the external violence. The ſenſible increaſe of hardneſs in a muſcle, when in a ſtate of contraction, may alſo be conſidered as a proof of an increaſed attraction of its particles to each other at that time."

The Doctor next conſiders whether or not a muſcle, when in a ſtate of contraction, undergoes any change of denſity. "Every homogeneous body (ſays he) poſſeſſes a certain degree of denſity, determined by the diſtance of its integrant particles. The moſt common means in nature by which the denſity of ſuch bodies is altered, are heat and cold; the one univerſally producing expanſion, the other condenſation. Whether mechanical force has the ſame effects, is a point in natural philoſophy not ſo well aſcertained; for though tenſion and colliſion produce in ſolid elaſtic bodies a change of figure, which they immediately reſume when the force is withdrawn, it has not been inquired whether in ſuch caſes a change of denſity takes place while the body is in a ſtate of elongation or compreſſion. Two elaſtic balls in the act of colliſion undergo a momentary change of figure, ſo that there muſt be an approximation of particles in the direction in which they are flattened; and in the elongation of an elaſtic cord by tenſion there muſt be an increaſed diſtance of the particles in one direction: but while theſe changes take place in one dimenſion of the reſpective bodies, they may be compenſated by contrary changes in the other dimenſions, ſo that the ſeveral bodies may preſerve, upon the whole, the ſame ſolid contents. In order to aſcertain this in the caſe of tenſion, which is the only caſe bearing analogy to muſcular motion, I made the following experiment: I took a piece of the elaſtic gum, or *caoutchouk*, three inches ſquare, and about the eighth of an inch in thickneſs; I procured a piece of ſheet tin three inches broad and about ſix inches long, cut into ſharp teeth at each end. The gum was firſt weighed in air, and found to be 280.25 grains. It was then weighed in water along with the tin, to which it was looſely attached, and the weight of both was then 758.75 grains. The gum was then ſtretched upon the tin by means of the teeth at each end to a ſurface of about five inches ſquare, the tin being bent ſo as to leave a free ſpace between it and the gum, in order that when immerſed in water no air-bubbles might be entangled. In this ſituation, the weight of both in water was found to be 746.75 grains. Here was a difference of 12 grains, which could be owing only to a diminution of ſpecific gravity; and in order to be ſure that there was no fallacy nor inaccuracy in the experiment, the gum was immediately diſengaged from one end of the tin ſo as to allow it to ſhrink; and being again weighed in this ſtate in the water, it was found to have recovered exactly its former weight."

From this very remarkable experiment, the Doctor argues to what may probably happen in the contraction of the muſcles. "This point (he ſays) cannot be decided but by an experimental examination. It might be determined whether a muſcle occupies moſt ſpace when relaxed or when contracted, by finding its ſpecific gravity in each of thoſe ſtates by means of the hydroſtatical balance. But this would be found extremely difficult; for the ſtate of contraction is very tranſitory, and the motion itſelf would produce ſuch a diſturbance as would render the reſult unſatisfactory. As there is this obſtacle to an experiment on a living muſcle, it occurred to me that it might be performed on the muſcles of a fiſh which had undergone the operation of *crimping*, as it is called; for in conſequence of dividing the muſcles, by cutting them when alive, they undergo a contraction which continues after death; and upon comparing by the hydroſtatical balance, portions of muſcle which had been crimped with thoſe of the oppoſite ſide of the ſame fiſh which had on purpoſe been ſaved from this operation, it did not appear that there was any difference in the ſpecific gravity. Two trials were made; one with the maſſeter muſcles of a ſkate, the other with the ſides of a large trout."

To determine whether the contraction or relaxation of a living muſcle made any alteration in its denſity, our author took one half of a living eel, and put it into a glaſs flaſk, of which the mouth was afterwards fuſed by a blow-pipe, and drawn out like the ſtem of a thermometer. The flaſk and tube being then filled with water, our author obſerved, with great attention, whether the convulſive agonies of the creature would make the fluid riſe or fall; but it did neither. The tail part of the eel was made uſe of in this experiment, that there might be no deception from the other, which contained the organs of reſpiration and the air-bladder. In one of his trials, the tail portions of two eels were introduced into the flaſk; but though they were frequently both in convulſions at once, not the leaſt motion of the fluid in the tube could be perceived. On this account alſo the Doctor made ſome experiments to decide the queſtion, Whether the mere circumſtance of life made any alteration in the gravity of bodies? His firſt trials were with animals of warm blood inclosed in glaſs and cloſe tin veſſels; but not being ſatisfied with the accuracy of theſe, from the difficulty of excluding all communication with the external air, he incloſed live eels in flaſks; and having ſealed them hermetically, he found that the weight of them when alive and when dead was the very ſame.

The reſult of all our author's experiments is, that "the contraction of a muſcle produces no change in its denſity, and that animated differs from inanimate matter in this reſpect, as well as in moſt of its other properties and laws. One purpoſe in nature for muſcles always preſerving the ſame denſity may be, that as ſome of them act in confined cavities, inconveniences might ariſe from their occupying more ſpace at one time than at another. In the extremities of cruſtaceous animals, for inſtance, which are filled with muſcles, a change of denſity would be apt to burſt them.

"Another circumſtance in which the contractions of muſcles differ from ſimple elaſticity is, that the former, however frequent and violent, does not produce any heat, as colliſion and tenſion are known to do. This may admit of ſome cavil with regard to animals of warm blood; for one of the theories with regard to animal heat is, that it ariſes from the perpetual vibration of muſcular fibres, particularly thoſe of the vaſcular ſyſtem; but this will not hold with reſpect to animals of cold blood, in which the actions of life are equally vigorous. The principal phenomena, therefore, of muſcular motion are, the ſhortening of the fibres, the lateral ſwell, the increaſe of coheſion and hardneſs, and the unchanged denſity and temperature. It would appear from the two laſt circumſtances, that the intimate motions of the particles in relation to one another muſt be different from what take place in the ſeveral inſtances of contraction and expanſion of dead bodies. In the expanſion ariſing from the action of heat and the contraction from cold, the change of denſity ſhows, that in the one caſe the ultimate particles muſt recede from each other, and in the other they muſt approach. The ſame may be ſaid of elaſticity. But as there is no alteration in the denſity of a muſcle in paſſing from relaxation to contraction, this change cannot conſiſt in the approximation of the integrant parts of the fibres, but muſt depend on ſome other circumſtances in the intimate diſpoſitions of the particles. In attempting to conceive in what this conſiſts, the following explanation may be offered. It is probable that the regular ſtructure of ſolid bodies depends on the polarity and ſhape of their integrant parts. Now all bodies, except ſuch as are ſpherical, muſt have a long and a ſhort axis; and let us imagine the fibres of muſcles to be compoſed of ſpheroidal particles, we may then conceive relaxation to conſiſt in their being diſpoſed within their long axis in the line of their fibres and contraction to conſiſt in their ſhort axis being diſpoſed more or leſs in that direction. This will not only account for the decurtation and uniform denſity, but for the lateral ſwell, and alſo for the increaſed hardneſs and coheſion; for though the particles do not approach or recede, as in bodies ſimply elaſtic, yet their power of attraction will be increaſed by their centres being brought nearer, and by being applied to each other by more oblate ſurfaces. This hypotheſis accords with what has been before proved concerning the unchangeable denſity, for what is loſt in one dimenſion is gained in another; and the cauſe for there being no increaſe in temperature depends probably on the ſame circumſtance by which the denſity is preſerved unaltered."

Thus far the Doctor has proceeded upon a plan, which may become plauſible by means of an hypotheſis at leaſt; but in the proſecution of his ſubject he is involved in the ſame difficulty which has proved too hard for every other perſon, and which he, indeed, does not attempt to ſolve. This is the action of ſtimuli, by which the muſcles are exerted to contraction, and upon which all the phenomena of life depends, and which indeed is the thing that particularly ought to be explained; but of this our author is forced to confeſs his entire ignorance, and to content himſelf with enumerating the ſtimuli of which he cannot explain the action. Stimuli then, according to him, are divided into internal and external. An example of the former kind is the circulation of the blood, which is kept up by an exciting influence of the blood upon the heart and veſſels which contain and impel it. The earlieſt perceivable inſtance of muſcular motion is the beating of the heart, as it is ſeen in the firſt rudiments of the embryo in an egg, and called the *punctum ſaliens*. There ſeems to be eſtabliſhed by nature a certain habitude of action between the veſſels and their fluids; for if a fluid even more mild than the blood, ſuch as milk, be injected into the circulation, it will produce great diſturbance; and if the blood, by being deprived of the influence of reſpirable air, becomes deſtitute of a certain property which it would naturally acquire in the act of reſpiration, it does not prove a ſtimulus to the heart.

In like manner, all the containing parts are accommodated to the nature of their reſpective contents.—The inteſtines are ſo calculated as to have proper motions excited in them by the aliment and the ſecretions which are mixed with it; and there are bodies which, though perfectly mild, ſuch as alimentary ſubſtances of difficult digeſtion, yet excite more violent commotions in the ſtomach than other ſubſtances which are very acrimonious. The various effects of poiſons in different parts of the body may alſo be mentioned as an illuſtration of the peculiar ſuſceptibility of the ſeveral organs of the body. The poiſon of a viper, for inſtance, is perfectly innocent, not only in the receptacles of the animal which produces it, but may be taken into the ſtomach of any animal without the leaſt bad effect, and only exerts its deleterious power when brought in contact with a wounded part. Some vegetable poiſons, on the contrary, ſuch as that of laurel water, prove deadly when taken into the mouth, or applied to any part of the alimentary canal, but are innocent when injected into the veins. It may be remarked alſo, that the receptacles of the ſeveral ſecreted fluids, ſuch as the gall-bladder and bladder of urine, are ſo adapted to their natural contents, by a due meaſure of irritability, as to bear their accumulation to a certain degree, and then to expel them. We have here alſo a proof that irritability is not in proportion to ſenſibility; for both theſe receptacles are extremely ſenſible to pain and irritation from extraneous acrimony, though ſo moderately ſenſible to the acrimony of their natural contents. This diſpoſition in the ſeveral organs to perform their natural functions, in conſequence of the ſtimulus of the reſpective fluids they contain, has aptly enough been called the natural perception of theſe organs.

Our author now conſidering that the internal organs are calculated to perform their functions in conſequence of certain ſtimuli, concludes the application of chemical and mechanical ſtimuli is not a mode of experiment likely to produce uſeful knowledge; and hence, he thinks, we may ſuggeſt the moſt likely means of reſtoring loſt irritability and action to the vital functions, when ſuſpended by ſuffocation, ſtrangulation, or immerſion. In theſe caſes, he ſays, that all other means are far inferior to that of inflating the lungs with atmoſpheric air, and ſtroking and preſſing the [illegible] in ſuch a manner as to imitate natural reſpiration. The only other thing which he ſuppoſes to be any way uſeful, is the application of heat to ſuch as have been immerſed in cold water; but of cool air to thoſe who have ſuffered from mephitic vapours.

The Doctor having then conſidered ſome other parts of the animal economy, enters into an inveſtigation of the analogy between motion and ſenſation. "This analogy (ſays he) is the more exact, that the nerves ſeem to be the inſtruments of both; for not only the organs of ſenſation and voluntary motion, but thoſe of involuntary motion, are ſupplied with nerves, and dependent upon them; for if the influence of the nerves leading to the heart or inteſtines is interrupted by cutting, ligature, or palſy, the function of theſe parts, is thereby deſtroyed. Thus, as there is a peculiar ſenſibility belonging to the ſeveral ſenſes, ſo is there a peculiar irritability belonging to the ſeveral organs of motion. The intention of nature, therefore, in diſtributing nerves to every muſcular organ, was probably in order to conſtitute thoſe peculiar perceptions on which the various vital and natural functions depend. But I give this only as a conjecture; and though the nervous influence may thus *modify* irritability, there is reaſon to think that it does not *beſtow* it."

Our author controverts the principle which has been held by ſome very able phyſiologiſts, that all muſcular irritability depends upon a ſentient principle. "There have been ſeveral inſtances (ſays he) of the production of fœtuſes without the brain; and a principal fact in ſupport of this opinion is, the exiſtence of animals without brain or nerves. That there are ſuch, was, I believe, firſt obſerved by Haller, and has been confirmed by Mr Hunter; who maintains farther, that the ſtomach is a centre or ſeat of life more eſſential to it than the brain. That the ſtomach ſhould be an organ of ſo much conſequence, ſeems natural enough from the importance of its function, which is that of aſſimilation; and life can be more immediately and completely extinguiſhed by an injury to it, ſuch as a blow, than by the ſame violence to any other part of the body. It is alſo well known, that the muſcular fibres of animals endowed with a nervous ſyſtem, will retain their irritability for ſome time after their ſeparation from the brain and nerves.—It is evident likewiſe, from the phenomena of vegetation, that riritability may exiſt in nature without ſenſation, conſciouſneſs, or any ſuſpicion of the exiſtence of a nervous ſyſtem. In favour of this opinion, it is farther obſervable, that thoſe animals which are deſtitute of brain and nerves are of the claſs of *vermes*, the moſt ſimple in nature, having only one function, viz. that of aſſimilation; and therefore not requiring that vatiety of action, and thoſe perceptions which are peculiar to more complex animals. Laſtly, the ſtate of an egg before incubation, and the condition of thoſe animals which become torpid from cold, and afterwards revive, affords facts which favour this opinion; as they ſhow that there is a certain principle of ſelf-preſervation, independent not only of the operation of the nervous ſyſtem, but even of the circulation; for in this quieſcent ſtate, thoſe portions of animal matter are preſerved for a great length of time from that corruption to which they would othewiſe be liable, and their fluids are prevented from freezing in a degree of cold which would congeal them, were they deſtitute of every principle of life."

In the courſe of his reaſoning, our author conſiders the nervous ſyſtem not only as a mere appendage to life, but as tending to impede its operation, and ſhorten its exiſtence. "Simple life (adds he) will not only ſurvive ſenſation, but will ſurvive it longer, if the animal is killed by deſtroying the nervous ſyſtem, than if it had been deſtroyed by hæmorrhagy, ſuffocation, or other violence. If a fiſh, immediately upon being taken out of the water, be ſtunned by a violent blow on the head, or by having the head cruſhed, the irritability and ſweetneſs of the muſcles will be preſerved much longer then if it had been allowed to die with the organs of ſenſe entire. This is is ſo well known to fiſhermen, that they put it it in practice in order to make them longer ſuſceptible of the operation called *crimping*. A ſalmon is one of the fiſhes leaſt tenacious of life, inſomuch that it will loſe all ſigns of life in leſs than half an hour after it is taken out of the water, if ſuffered to die without any farther injury; but if, immediately after being caught, it receives a violent blow on the head, the muſcles will ſhow viſible irritability for more than 12 hours afterwards."

To the ſame purpoſe, our author obſerves, that in warm-blooded animals an exceſſive exertion of voluntary motion immediately before death, prevents the muſcles from being rigid when cold, and renders them more prone to putrefaction. Thus, if an ox is killed immediately after being overdrove, the carcaſe will not become ſtiff when it grows cold, nor is it capable of being preſerved by means of ſalt. In confirmation of the ſame hypotheſis alſo, our author obſerves, that in ſome diſorders of the brain, ſuch as hydrocephalus, and apoplectic palſy, in which the functions of the brain are ſuſpended, the office of digeſtion is ſometimes better performed than in health.

From all this our author concludes, along with Mr Hunter, that the exerciſe of ſenſation is inimical to life, and that a ſort of fatigue is induced by this as well as by voluntary motion; "ſo that all that intercourſe carried on through the nerves, whether *towards* the brain in the caſe of ſenſation, or *from* the brain in acts of volition, tends to wear out the animal powers. And, as intenſe and long continued thought, thought not terminating in any outward action, tends alſo to produce an inability for farther exertions, it would appear that the brain or ſenſorium is more particularly the organ which is ſubject to that ſpecies of ſufferance called *fatigue*. From theſe facts we perceive the neceſſity of ſleep, which conſiſts in a temporary ſuſpenſion of ſenſation, volition, and thought, and is a reſource of nature, whereby the powers of life recover themſelves after ſatiety and fatigue, which are provided as guards to warn us when nature is in danger of being ſtrained, either by repletion or over-exertion; and it is evident that ſuch barriers were abſolutely neceſſary, in order to ſet bounds to operations which are only occaſionally requiſite, and which would otherwiſe depend on the caprice of the will. The exerciſe of ſenſation and voluntary motion in a moderate degree is conformable to the intention of nature, and therefore ſalutary; and it is only when they are exceive that they tend to wear out the powers of life, and more eſpecially if theſe are not duly recruited by ſleep. It follows, from the ſame principle, that when life is threatened by certain diſeaſes, of which the chief ſymptom is irritation, any means by which ſenſation, whether natural or morbid, and muſcular motion, whether voluntary, or involuntary, convulſive or ſpaſmodic, can be ſoothed or ſuſpended, will prove ſalutary, by allowing the powers of life to rally as it were, and to recover themſelves. In this conſiſts the operation of narcotic medicines, ſuch as opium;—which, in complaints both of a general and local nature, proves uſeful, not merely as a palliative by the removal of temporary pain or ſpaſm, or by procuring ſleep, but as a principal inſtrument of recovery, by allowing the powers of life to exert their natural action, in conſequence of the removal of irritation."

In treating this ſubject, the Doctor conſiders the effects of opium as affecting ſimple or ſenſitive life; and to determine this, he made the following experiments: Having made a ſolution of opium in water he put into one portion of it ſome ſound living eels, and others with their heads bruiſed; and in a number of trials it was found that the ſound eels generally died much ſooner than the bruiſed ones. This, however was the caſe only when the ſolution was of a certain degree of ſtrength, ſuch as half a grain of opium at leaſt to an ounce of water; for when only about half this ſtrength, the ſound eels lived much longer, the time being then protracted to that in which the bruiſed eels would have died merely in conſequence of their injury; but it muſt be obſerved, that even the wounded ells died conſiderably ſooner than when put into plain water.

From all this, our author concludes, that "the great maſſes of muſcle in the trunk and extremities of the body are the inſtruments of the mind in acting upon external bodies; and we may therefore rank in the liſt of ſtimuli the nervous power by which the will and the paſſions excite external motions. This is a function ſufficiently important for the nerves, without admitting them as the principle on which irritability depends."

Having diſclaimed all inquiry into the connection between muſcular motion and volition, the Doctor proceeds to conſider the effects of the different paſſions upon the muſcles. Though theſe are diſtinct from the motion directly produced by the will, yet he conſiders them among thoſe ariſing from conſciouſneſs; "for there are emotions of the mind which have viſible and powerful effects upon the heart and vaſcular ſyſtem, which are organs entirely out of the reach of the will. Not to mention the well-known effects of grief, fear, and joy, which affect the whole circulation, there are certain paſſions and ſentiments which produce partial and local effects. Theſe are eſtabliſhed by nature, either to anſwer ſome important purpoſe in nature, as in the caſe of the congeſtion of the fluids in the parts of generation in conſequence of the venereal appetite, or to ſerve as natural expreſſions, as in the caſe of bluſhing, or weeping. One of the moſt ſtriking effects of the paſſions upon muſcular action, is the influence they have upon the ſtrength or mechanical force of the voluntary muſcles. Fear produces debility almoſt amounting to palſy. Courage and ardour of mind, on the contrary, add to the natural ſtrength. When the mind is agitated by ſome intereſting object, and calls upon the body for an extraordinary exertion to effect its end, the muſcles are thereby enabled, as it were by magic, to perform acts of ſtrength of which they would be entirely incapaple in cold-blood. In circumſtances of danger, for inſtance, where life or honour are at ſtake, exertions are made for overcoming mechanical reſiſtence which ſeem incredible, and would be impoſſible, were not the mind in a ſort of phrenzy; and it is truly admirable in the economy of nature, that an idea in the mind ſhould thus in a moment augment the powers of motion and inſpire additional reſources of ſtrength adequate to the occaſional calls of life. The great increaſe of ſtrength in maniacs is alſo referable to the paſſions of the mind. Theſe conſiderations would almoſt lead us to doubt whether or not the accounts we have of the great feats of ſtrength aſcribed to individuals in the heroic ages be fabulous or not. It is alſo worthy of remark, that, in great and laſting exertions of ſtrength to which men are impelled by active and generous affections, fatigue is not induced in the ſame proportion by many degrees as by the ſame quantity of muſcular action in the cool and deliberate actions of common life."

Having thus diſcuſſed the ſubject of *internal* ſtimuli, our author next proceeds to take notice of the ſecond claſs, viz. ſuch as are *external*. Theſe are either immediate or remote, viz. ſuch as are excited by mechanical means, or by acrimony directly and artificially applied to a muſcular fibre; or ſuch as occur in the inſtances of ſympathy, and in the caſe of thoſe inſtincts which nature has inſtituted for the purpoſe of ſelf-preſervation in brutes, and in the early part of human life. "There are certain habitudes (ſays he) between outward ſtimuli and the moving powers whereby natural propenſities are conſtituted equally neceſſary to the ſupport of life as the internal functions. Thus, in a new born animal, the firſt contact of the external air excites the act of reſpiration, and the contact of the nipple excites the act of ſucking; both of which actions are abſolutely neceſſary to the maintenance of life, and require the nice co-operation of a great number of muſcles prior to all experience. Actions of this kind are called *inſtinctive*; but though diſtinct from thoſe of voluntary motion, they nevertheleſs run into one another; ſo that what was at firſt merely inſtinctive, may afterwards become a matter of deliberate choice. The ſame muſcles are the inſtruments of both; and they differ from the muſcles obeying the internal ſtimuli, ſuch as the heart, in being liable to fatigue, and thereby concurring with the exerciſe of ſenſation and of thought, in rendering ſleep neceſſary. There are no muſcles except thoſe of reſpiration, of which the conſtant action is neceſſary to life, and which are void of conſciouſneſs in their ordinary exerciſe but which are yet in ſome meaſure under the controul of the will. The principal end anſwered by this power of the will over the muſcles of reſpiration in man, is to form and regulate the voice. Though inſtinctive motions are in ſome caſes convertible into thoſe which are voluntary, they ought by no means to be confounded together; for even thoſe animals which are deſtitute of brain and nerves, are capable of actions evidently of the inſtinctive kind.—

A leech, for inſtance, being brought into contact with a living animal, is impelled by an inſtinct of its nature to faſten upon it, and ſuck its blood. There is ſomething very ſimilar to this even in vegetables, as in the caſe of tendrils and creeping plants being ſtimulated by the contact of other bodies to cling round them in a particular direction.

*See Vegetable Motion.

Beſides theſe obſervations on the inferior animals, our author brings ſome experiments to ſhow, that inſtinctive actions, even in animals furniſhed with a brain and nerves, do not depend on ſenſation. Having divided the ſpinal marrow of a live kitten a few days old, he irritated the hind-paws by touching them with a hot wire. By this the muſcles of the poſterior extremities were thrown into contractions, ſo as to produce the motion of ſhrinking from the injury; and the ſame effects were obſerved in another kitten of which the head was entirely ſeparated from the body. In repeating this experiment he found, that when the ſpinal marrow was cut through between the lumbar vertebræ and os ſacrum, the poſterior extremities loſt their irritability, but the tail reſumed it. Even the head retained its irritability after it was cut off; as appeared by touching the ears with a hot wire, or by pricking them: "and (ſays our author) as the extremities are alſo irritable, it will not be ſaid that conſciouſneſs and ſenſation exiſt in two ſeparated portions of the body."

The effects of habit are then conſidered; and the concluſion from the doctor's reaſoning upon this ſubject is, that "there is a *co-ordinance*, or pre-eſtabliſhed harmony, as it were, between the faculties of animals and the laws of external matter, which is the foundation of all the inſtinctive habits of animals, as well as the rational conduct of man."

To the law of habit have been referred the effects of certain contagions, ſuch as that of the ſmall-pox, which do not produce their effect more than once in life. With reſpect to this he obſerves, "that upon whatever principle this property of the animal economy depends, it is an undoubted fact, that theſe morbid poiſons, after exciting a certain degree of diſturbance, and a certain ſeries of diſeaſed actions, no longer make any impreſſion on the powers of life, otherwiſe there could be no ſuch thing as recovery; for at the time in which a perſon begins to recover from the ſmall-pox, the poiſon actually preſent in the circulating ſyſtem is multiplied infinitely beyond what it was when it excited the diſeaſe. The conſtitution has therefore at that time, with reſpect to this acrimony, acquired an inſenſibility, or rather want of irritability; and this it preſerves ever afterwards. This, however, holds only with regard to thoſe morbid poiſons which excite febrile affections, and ſeems to be a neceſſary proviſion of nature to guard againſt ſuch noxious principles as are generated within the body itſelf."

Having laſtly conſidered the effects of *irritation* upon the human body, the Doctor goes on to conſider a very remarkable property of living muſcles, viz. that of their being in a conſtant ſtate of tenſion, more or leſs, independent of any temporary ſtimulus. This is evident from what happens when any muſcle is cut; for then there is an immediate retraction of the ſeparated parts: and that this is their natural ſtate is farther proved by the ſpontaneous motion which takes place in conſequence of the relaxation of an antagoniſt muſcle, as when the mouth is drawn to one ſide in conſequence of hemiplegia. Some degree of tenſion indeed is neceſſary for the performance of the natural motions of the muſcles, whether voluntary or involuntary; and the vigour with which the ſeveral actions are performed depends on the due degree of this tone.

This tone of muſcles is every where maintained by a certain counteracting mechanical power; the great muſcles are kept on the ſtretch by the bones, the heart and veſſels by the maſs of fluids, and the inteſtines by the aliments taken in, and their other contents. Diſeaſes of various kinds may ariſe from the different degrees of this tenſion, and the vaſcular ſyſtem is more apt to be affected by different degrees of tenſion than any other part of the body; and our author conſiders what is called a *nervous* habit as one of the effects of want of tenſion. He likewiſe attributes to the different degrees of tenſion, more than to any thing elſe. the great difference of conſtitutions obſervable among mankind. He obſerves alſo that the tenſion of the muſcles is greatly affected by ſympathy. "This (ſays he) is particularly obſerved in the blood-veſſels and inteſtines; for a relaxation in theſe will produce a like affection in every other part of the animal ſyſtem. With regard to the inteſtines, it may be mentioned among other proofs, that it is common for perſons in a ſtate of great weakneſs to be affected by ſyncope and even inſtantaneous death, in the act of evacuating the bowels. It ſeems to be from a like cauſe that a temporary lowneſs is produced by an abſceſs being opened.

The Doctor concludes his ſubject with conſidering the muſcles as mechanical powers. "As they conſtitute the ſtrength of animals, it may be proper to conſider the relation of their ſtrength to their bulk, and the relation of the bulk and ſtrength of the body to the denſity and coheſion of its own materials; and to the bulk, denſity, and coheſion of the external inanimate bodies with which it is converſant.

"It has been demonſtrated by Galileo, that in ſimilar unequal bodies, of a cylindrical or priſmatic ſhape, ſuch as the limbs of animals nearly are, the ratio of their efforts to break by their own weight is in the quadruplicate ratio of their lengths; but that the reſiſtance they make to the ſame force is only in the triplicate ratio of their lengths. It follows from this, that in order to endow the limbs of animals with the ſame relative force, it is not only neceſſary that the bones ſhould poſſeſs an increaſed proportion of thickneſs, in order to give an adequate increaſe of what may be called the dead ſtrength; but a ſimilar increaſe of living ſtrength is neceſſary, by a ſuitable addition of muſcular power, in order to keep pace with the increaſed ſize of the bones. Now we obſerve, in fact, that in the large-ſized animals, ſuch as the bull and the elephant, the thickneſs both of their bones and muſcles becomes greater in proportion to the length of their limbs than in the ſmaller animals, and they are therefore of a leſs elegant form. But nature has not carried this ſo far as to compenſate for the diſadvantage ariſing from the increaſe of ſize; for the greater animals have not the ſame proportion of ſtrength, in relation to their bulk, that the ſmaller animals have. It has been computed that a man can draw from the to 80 times its own weight, whereas a horſe cannot with eaſe draw more than three times his own weight. This diſproportion between ſize and ſtrength is very obſervable in different individuals of the human ſpecies; for tall men are not muſcular, even in the ſimple proportion of their ſtature."

Our author now proceeds to aſſign ſome reaſons why the ſtature of mankind in general is not larger than we ſee it. Some obſervations upon this ſubject are made under the article Giant, where it is attempted to ſhow, that by increaſing the proportional ſtrength of the materials, the ſize of the human body might have been augmented in any proportion. To this, however, the Doctor replies, that "had the bones been harder, they would not have been calculated for the common duration of life, the effect of which being to increaſe their hardneſs and dryneſs, they muſt be endowed originally with a certain degree of ſoftneſs and ſucculence: and, with regard to muſcles, a degree of hardneſs much greater than they poſſeſs would have been incompatible with their contractility." But this reaſoning does not ſeem to be concluſive. The bones of a lion are ſaid to be much harder than thoſe of any other animal; yet we do not find that theſe creatures are liable to any kind of diſeaſe in conſequence of this ſuperior hardneſs. Neither is any inconvenient degree of hardneſs in the muſcles a neceſſary conſequence of their increaſed ſtrength; for ſilk, though equally ſoft and flexible, nay much more ſo than hemp or flax, is nevertheleſs much ſtronger; and we cannot by any means doubt, that if men had formerly been of a larger ſtature than they are at preſent, the materials of their bones and muſcles might have been proportionably ſtronger, without the leaſt injury or impediment to any of the operations of life.

When we conſider the manner in which the muſcles act upon the bones into which they are inſerted, we may be apt to think that nature has been very prodigal of mechanical power; for conſidering the bones as levers, the muſcles act upon them at a very great diſadvantage, being always inſerted much nearer the fulcrum than the weight to be raiſed. Thus the two muſcles of the arm, named *biceps* and *brachiæus internus*, in order to ſupport in the hand a weight of one pound with the fore-arm at right angles to the humerus, muſt exert a power equal to ten pounds. Another circumſtance alſo which tends to waſte the power, is the obliquity with which they are inſerted into their bones; ſo that the greater part of the force is expended in preſſing one bone againſt another at the articulation, and only a ſmall part of it in making the flexures and extenſions. Theſe diſadvantages, however, are compenſated by a number of conveniences which could not have been obtained on any other plan. We muſt diſtinguiſh between thoſe actions which conſiſt in preſſure and thoſe which depend on percuſſion; for as the momentum of this laſt depends on velocity, it is evident that there muſt be a great advantage from the inſertion of the tendon being near the centre of motion, as greater velocity with leſs expence of contraction will thus be communicated to the extremity. The muſcles, for inſtance, which are attached to the *olecranon*, in performing thoſe actions with the hand which require rubbing, act with a diſadvantage exactly proportioned to the inequality of the diſtance from their inſertion to the joint of the elbow, and that from the ſame joint to the hand. This is an act of preſſure. But in the caſe of percuſſion, as in the action of uſing a hammer, there is an evident advantage reſulting from the velocity communicated to the extremity; for in order to have produced the ſame velocity, with the inſertion at a greater diſtance from the centre of motion, a much greater degree of contraction would have been neceſſary: and our author ſhows that fatigue principally depends on a contraction of the muſcles. "If any one (ſays he) will take the trouble of comparing the fatigue of the biceps muſcle, in bearing a weight in the hand with the elbow-joint bent to a right angle with that of bearing the ſame weight for the ſame length of time with the joint at an acute angle, he will be ſenſible how much the degree of fatigue depends on the extent of contraction; and, by attending to the relative ſituation of muſcular fibres, it will appear, that Nature, in diſtributing the fibres of muſcles obliquely, has had it in view not only to increaſe their number, but to ſave contraction."

In conſidering the actions of the various muſcles in producing the different actions of the body, we find ſcarce one produced that can be called direct. In ſome inſtances, we find two muſcles, or two ſets of muſcles, co-operating, ſo that the motion effected by them ſhall be in the diagonal of their direction. This is the caſe of the oblique muſcles of the abdomen in ſome of their actions, and of the intercoſtal muſcles in all theirs. Sometimes different portions of the ſame muſcle combine in like manner to produce a ſimilar effect: and in all the long muſcles, however ſimple their origin and inſertion may be, there is an internal obliquity of their fibres with regard to one another; for theſe do not run from end to end, but there are parts of the tendon running into the belly of the muſcle, ſo as to divide it into penniform and rhomboidal portions. This diſtribution of the fibres takes off from the length; but as it takes place in thoſe caſes where the origin and inſertion are at a conſiderable diſtance, this can be afforded: and this, as well as the waſte of power, in conſequence of oblique action, is more than compenſated by the increaſed ſtrength from the fibres being multiplied; for, in conſequence of this ſtructure, there is an extent of tendon afforded ſufficient for the inſertion of a greater number of fleſhy fibres.

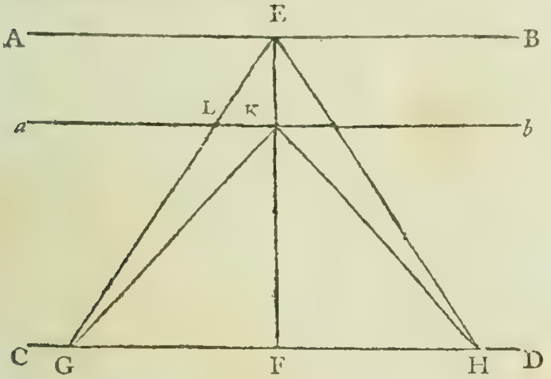
The Doctor illuſtrates this principle in the mechaniſm of muſcular action from the example of fiſh; a ſpecies of animals which exert greater muſcular powers than any others. "The muſcles of moſt fiſh (ſays he) conſiſt of regular ſeries of oblique ſhort fibres, forming thoſe ſtrata which every one muſt have obſerved in their muſcular ſubſtance. Their motions are more ſimple and limited than thoſe of land-animals. but much more vigorous; for a fiſh in the ſea has to make its way through a medium about 1000 times more denſe than air, and with more rapidity than thoſe which inhabit the land. Nature, therefore, inſtead of giving them muſcles whoſe fibres would run ſtraight from one end of their body to the other, has multiplied their numbers, by diſtributing them into ſhort and oblique portions. I have ſeen the ſword of a ſword-fiſh ſticking in a plank, which it had penetrated from ſide to ſide: and when it is conſidered

that

Muſcle.

that the animal was then moving through ſo denſe a medium, and in the ſame direction with the ſhip, we muſt form a high conception of its muſcular power."

Laſtly, our author gives a mathematical demonſtration, that by the obliquity of the muſcles a very conſiderable quantity of contraction is ſaved, and conſequently a proportional degree of fatigue prevented.— "Let the line AB (ſays he) in the annexed diagram, repreſent a moveable bone, and the line CD a fixed bone parallel to it. Let FE, perpendicular to theſe lines, repreſent a muſcle acting in its own direction, and the lines GE, HE, repreſent two muſcles acting obliquely, and producing by a diagonal action the ſame effect as the other. If the bone AB be brought to the ſituation *a b* by the action of the muſcle FE, the muſcle will then be in the ſituation FK. If the bone is brought in the ſame ſituation by the action of the muſcles GE, HE, theſe muſcles will then be in the ſituation GK, HK.



"The propoſition to be demonſtrated is, that the line GK bears a greater proportion to the line GE, than the line FK does to line FE; for FK is to FE as GL is to GE (Euc. Elem. B. vi. Prop. 2.); and the angle ELK being leſs than a right angle, the angle GLK, which is adjacent to it, muſt be greater than a right angle; and the angle GKL being in the ſame triangle with GLK, muſt be leſs than a right angle. The line GK, therefore, which ſubtends the greater angle, is greater than the line GL, ſubtending the leſſer, and therefore bears a greater proportion to GE. But the line GL is to GE as FK is to FE; and therefore GK bears a greater proportion to GE than FK does to FE; that is, the fibres of the muſcles acting obliquely, ſuffer a leſs proportional decurtation than thoſe of the muſcle acting directly.

"It is farther obvious, that the more oblique the action becomes, the greater ſaving there will be of contraction; for in moving the line *a b* towards CD, the line FK diminiſhes in a ſwifter ratio than the line GK; and when the former has vaniſhed, the latter is in the ſituation GF."

Beſides theſe advantages in point of diminiſhing fatigue, there are others relating to the ſhape of the members. Thus, if the inſertions of the muſcles had been at a great diſtance from the joints, they muſt upon every occaſion have paſſed like bow-ſtrings from one bone to the other, and the limbs muſt have been exceedingly clumſy and unwieldy; all the motions muſt alſo have been extremely ſlow; and notwithſtanding the ſuperior ſtrength which people would then have enjoyed, it is very plain that they would ſcarce have been fit for any of the offices of life which they now perform.

Muſcle, Muſes.

Muſcle, in zoology. See Mytilus.

MUSCOVY. See Russia.

Muſcovy-Glaſs, or Glimmer. See Mica.

MUSCULUS, a military machine, made uſe of by the Romans to cover and protect the ſoldiers while they approached and undermined the walls of beſieged places, or filled the ditches. It ſeems to have reſembled the teſtudo in form, but was ſmaller in ſize. See Testudo.

MUSEIA, were Grecian feſtivals in honour of the Muſes, celebrated with games every fifth year, particularly by the Theſpians. The Macedonians alſo obſerved a feſtival of the ſame name in honour of Jupiter and the Muſes, which laſted for nine days, and was celebrated with ſtage plays, ſongs, and poetical compoſitions.

MUSES, certain fabulous deities among the Pagans, ſuppoſed to preſide over the arts and ſciences; for this reaſon it is uſual for the poets, at the beginning of a poem, to invoke theſe goddeſſes to their aid.

The muſes were originally only ſingers and muſicians in the ſervice of Oſiris, or the great Egyptian Bacchus, under the inſtruction and guidance of his ſon Orus; but in ſucceeding times they were called the *daughters of Jupiter and Mnemoſyne* or *Memory*.

Theſe are the only pagan divinities whoſe worſhip has been continued through all ſucceeding changes in the religion and ſentiments of mankind. Profeſſors of every liberal art in all the countries of Europe ſtill revere them; particularly the poets, who ſeldom undertake the ſlighteſt work without invoking their aid.

Sir Iſaac Newton tells us, that the ſinging women of Oſiris were celebrated in Thrace by the name of the *Muſes*; and that the daughters of Pierius, a Thracian, imitating them, were celebrated by the ſame name.

Diodorus Siculus informs us, that Alcman of Meſſene, a lyric poet who flouriſhed in the 27th Olympiad, 670 years B. C. makes them the daughters of Uranus and Terra. It has been aſſerted by ſome ancient writers, that at firſt they were only three in number, but Homer, Heſiod, and other profound mythologiſts, admit of nine (A).

In his hymn to Apollo, Homer ſays,

——By turns the *nine* delight to ſing.

And Heſiod, in his theogony, names them all.— They are ſaid ſeverally to preſide over ſome art or ſcience, as muſic, poetry, dancing, aſtronomy. By ſome they are called *virgins*, becauſe the virtues of education appear unalterable: they are called *muſes* from a Greek word which ſignifies to explain myſteries, becauſe they have taught things the moſt curious and

Burney's Hiſt. of Muſic.

(A) It has been ſaid, that when the citizens of Sicyon directed three ſkilful ſtatuaries to make each of them ſtatues of the three Muſes, they were all ſo well executed, that they did not know which to chooſe, but erected all the nine, and that Heſiod and Homer only gave them names.

Muſes.

and important to know, and which are above the comprehenſion of vulgar minds. Each of their names is ſaid to include ſome particular allegory; *Clio*, for inſtance, has been thus called, becauſe thoſe who are praiſed in verſe acquire immortal fame; *Euterpe*, on account of the pleaſure accruing to thoſe who hear learned poetry; *Thalia* implies for ever flouriſhing; *Melpomene*, that her melody inſinuates itſelf into the inmoſt receſſes of the ſoul; *Terpſichore* marks the pleaſure which thoſe receive who are verſed in the liberal arts; *Erato* ſeems to indicate, that the learned command the eſteem and friendſhip of all mankind; *Polyphymnia*, that many poets are become immortal by the number of hymns which they have addreſſed to the gods; *Urania*, that thoſe whom ſhe inſtructs elevate their contemplations and celebrity to the heavens and the ſtars; and laſtly, the exquiſite voice of *Calliope* has acquired her that appellation, as the inventreſs and guardian of eloquence and rhetoric.

An epigram of Callimachus gives the attributes of the muſes in as many lines.

Calliope the deeds of heroes ſings;
Great *Clio* ſweeps to hiſtory the ſtrings;
Euterpe teaches mimes their ſilent ſhow;
Melpomene preſides o'er ſcenes of wo;
Terpſichore the flute's ſoft pow'r diſplays;
And *Erato* gives hymns the gods to praiſe;
Polymnia's ſkill inſpires melodious ſtrains;
Urania wiſe, the ſtarry courſe explains;
And gay *Thalia's* glaſs points out where folly reigns.

This epigram does not however, exactly correſpond with the ideas of other poets, or of the ancient painters, in characteriſing the attributes of the muſes. The ancients had numberleſs ingenious and fanciful ideas concerning the muſes, which we have not room to recite.—"It ſeems (ſays the Abbe Barthelemi[*]) as if the firſt poets, enchanted with the beauties of nature, occaſionally were led to invoke the nymphs of the woods, hills, and fountains; and that yielding to the prevailing taſte for allegory, they gave them names relative to the influence they might be ſuppoſed to have over the productions of the mind. At firſt three muſes only were admitted, Melete, Mneme, and Aœde: that is to ſay, the meditation or reflection neceſſary to ſtudy; memory which records illuſtrious deeds; and ſong which accompanies their recital. In proportion as improvement was made in the art of verſification, its characters and effects were perſonified, the number of the muſes increaſed, and the names they now received referred to the charms of poetry, its celeſtial origin, the beauty of its language, the pleaſure and gaity it inſpires, the ſong and dance which add to it new charms, and the glory with which it is crowned. Afterwards were aſſociated with them the Graces, whoſe employment it is to embelliſh poetry, and Love who is ſo frequently its object. Theſe ideas took birth in a barbarous country, in Thrace, where Orpheus, Linus, and their diſciples, ſuddenly appeared in the midſt of ignorance. The muſes were honoured there on the Pierian mount, and extending their dominion, ſucceſſively took their ſtations on Pindus, Parnaſſus, Helicon, and all thoſe ſolitary places where the painters of nature, ſurrounded by the moſt pleaſing images, experience the divine glow of inſpiration."

Muſeum
‖
Muſhroom.

Pythagoras, and afterwards Plato, make the muſes the ſoul of the planets in our ſyſtem; from whence the imaginary muſic of the ſpheres.

MUSEUM, a name which originally ſignified a part of the palace of Alexandria, which took up at leaſt one-fourth of the city. This quarter was called the *muſeum*, on account of its being ſet apart for the muſes and the ſtudy of the ſciences. Here were lodged and entertained the men of learning; who were divided into many companies or colleges, according to the ſciences of which they were the profeſſors; and to each of theſe houſes or colleges was allotted a handſome revenue. The foundation of this eſtabliſhment is attributed to Ptolemy Philadelphus, who here placed his library. Hence the word *muſeum* is now applied to any place ſet apart as a repoſitory for things that have an immediate relation to the arts.

The muſeum at Oxford, called the *Aſhmolean muſeum*, is a noble pile of building, erected at the expence of the univerſity, at the weſt end of the theatre, at which ſide it has a magnificent portal, ſuſtained by pillars of the Corinthian order. The front, which is to the ſtreet, extends about 60 feet, where there is this inſcription over the entrance in gilt characters, *Muſeum Aſhmoleanum, ſchola naturalis hiſtoriæ, officina chymicha.* It was begun in 1679, and finiſhed in 1683, when a valuable collection of curioſities was preſented to the univerſity by Elias Aſhmole, Eſq: which were the ſame day repoſited there; ſeveral acceſſions have been ſince made to the muſeum; among which are hieroglyphics, and other Egyptian antiquities, an entire mummy, Roman antiquities, altars, medals, lamps, &c. and a variety of natural curioſities.

The Britiſh muſeum in London is a large, beautiful, and magnificent building, the nobleſt cabinet of curioſities in the world. See the article LONDON, nº 155.

MUSGRAVE (Dr William), a learned phyſician and antiquary, was born at Charlton-Muſgrave in Somerſetſhire, about the year 1657; and ſtudied at New-college, Oxford. Having diſtinguiſhed himſelf by his knowledge in his profeſſion, and his ſkill in natural philoſophy, he was elected fellow of the Royal Society; and being made ſecretary in 1684, he continued the Philoſophical Tranſactions from nº 167 to nº 178 incluſive. After having taken his degrees in phyſic, and being admitted a fellow of the college of phyſicians, he went and ſettled at Exeter, where he practiſed phyſic with great reputation and ſucceſs. Being a man of extenſive learning, he compoſed, at his leiſure hours, ſeveral curious and valuable works; as, 1. *De arthritide anomala ſive interna diſſertatio*, 2. *De arthritide ſymptomatica diſſertatio.* 3. *Julii Vitalis epitaphium, cum commentario.* 4. *De legionibus epiſtola.* 5. *De aquilis Romanis epiſtola.* 6. *Inſcriptio Terraconenſis, cum commentario.* 7. *Geta Britannicus*, &c.—8. *Belgium Britannicum.* This learned phyſician died in 1721.

MUSHROOM, in botany. See AGARICUS and LYNCURIUS.

To try the quality of muſhrooms:—Take an onion, and ſtripe the outer ſkin, and boil it with your muſhrooms: if the onion become blue or black, there are certainly dangerous ones amongſt them; if it remain white, they are good.

[*] Travels of Anacharſis, vol. iii. p. 261.

M U S I C;

1 Definition

THE art of combining ſounds in a manner agreeable to the ear. This combination may be either ſimultaneous or ſucceſſive : in the firſt caſe, it conſtitutes harmony ; in the laſt melody. But though the ſame ſounds, or intervals of ſound, which give pleaſure when heard in ſucceſſion, will not always produce the ſame effect in harmony ; yet the principles which conſtitute the ſimpler and more perfect kinds of harmony, are almoſt, if not entirely the ſame with thoſe of melody. By *perfect harmony*, we do not here mean that plenitude, thoſe complex modifications of harmonic ſound, which are admired in practice; but that harmony which is called *perfect* by theoricians and artiſts: that harmony which reſults from the coaleſcence of ſimultaneous ſounds produced by vibrations in the proportions of thirds, fifths, and octaves, or their duplicates.

The principles upon which theſe various combinations of ſound are founded, and by which they are regulated, conſtitute a ſcience, which is not only extenſive but profound, when we would inveſtigate the principles from whence theſe happy modifications of ſound reſult, and by which they are determined ; or when we would explore the ſenſations, whether mental or corporeal, with which they affect us. The ancient definitions of muſic are not proportioned in their extent to our preſent ideas of that art ; but M. Rouſſeau betrays a temerity highly inconſiſtent with the philoſophical character, when from thence he infers, that their ideas were vague and undetermined. Every ſoul ſuſceptible of refinement and delicacy in taſte or ſentiment, muſt be conſcious that there is a muſic in action as well as in ſound ; and that the ideas of beauty and decorum, of harmony and ſymmetry, are, if we may uſe the expreſſion, equally conſtituent of viſible as of audible muſic. Thoſe illuſtrious minds, whoſe comprehenſive proſpects in every ſcience where taſte and propriety prevail took in nature at a ſingle glance, would behold with contempt and ridicule thoſe narrow and microſcopic views of which alone their ſucceſſors in philoſophy have diſcovered themſelves capacious. With theſe definitions, however, we are leſs concerned, as they bear no proportion to the ideas which are now entertained of muſic. Nor can we follow M. Rouſſeau, from whatever venerable ſources his authority may be derived in adopting his Egyptian etymology for the word *muſic*. The eſtabliſhed derivation from *Muſa* could only be queſtioned by a paradoxical genius. That muſic had been practiſed in Egypt before it was known as an art in Greece, is indeed a fact which cannot be queſtioned ; but it does not thence follow that the Greeks had borrowed the name as well as the art from Egypt. If the art of muſic be ſo natural to man that vocal melody is practiſed wherever articulate ſounds are uſed, there can be little reaſon for deducing the idea of muſic from the whiſtling of winds through the reeds that grew on the river Nile. And indeed, when we reflect with how eaſy a tranſition we may paſs from the accents of ſpeaking to diatonic ſounds ; when we obſerve how early childen adapt the language of their amuſements to meaſure and melody, however rude ; when we conſider how early and univerſally theſe practices take place—there is no avoiding the concluſion, that the idea of muſic is connatural to man, and implied in the original principles of his conſtitution. We have already ſaid, that the principles on which it is founded, and the rules by which it is conducted, conſtitute a ſcience. The ſame maxims when applied to practice form an art : hence its firſt and moſt capital diviſion is into *ſpeculative* and *practical* muſic.

Speculative muſic is, if we may be permitted to uſe the expreſſion, the knowledge of the nature and uſe of thoſe materials which compoſe it ; or, in other words, of all the different relations between the high and low, between the harſh and the ſweet, between the ſwift and the ſlow, between the ſtrong and the weak, of which ſounds are ſuſceptible : relations which, comprehending all the poſſible combinations of muſic and ſounds, ſeem likewiſe to comprehend all the cauſes of the impreſſions which their ſucceſſion can make upon the ear and upon the ſoul.

Practical muſic is the art of applying and reducing to practice thoſe principles which reſult from the theory of agreeable ſounds, whether ſimultaneous or ſucceſſive ; or, in other words, to conduct and arange ſounds according to the proportions reſulting from conſonance, from duration and ſucceſſion, in ſuch a manner as to produce upon the ear the effect which the compoſer intends. This is the art which we call *compoſition* *. With reſpect to the actual production of ſounds by voices or inſtruments, which is called *execution*, this department is merely mechanical and operative; which, only preſuppoſing the powers of ſounding the intervals true, of exactly proportioning their degrees of duration, of elevating or depreſſing ſounds according to thoſe gradations which are preſcribed by the tone, and to the value required by the time, demands no other knowledge but a familiar acquaintance with the characters uſed in muſic, and a habit of expreſſing them with promptitude and facility.

*See Compoſition.

Speculative muſic is likewiſe divided into two departments ; *viz.* the knowledge of the proportions of ſounds or their intervals, and that of their relative durations ; that is to ſay, of meaſure and of time.

The firſt is what among the ancients ſeem to have been called *harmonical* muſic. It ſhows in what the nature of air or melody conſiſts ; and diſcovers what is conſonant or diſcordant, agreeable or diſagreeable, in the modulation, It diſcovers, in a word, the effects which ſounds produce on the ear by their nature, by their force, and by their intervals ; which is equally applicable to their conſonance and their ſucceſſion.

The ſecond has been called *rhythmical*, becauſe it treats of ſounds with regard to their time and quantity. It contains the explication of their continuance, of their proportions, of their meaſures whether long or ſhort,

ſhort, quick or ſlow, of the different modes of time and the parts into which they are divided, that to theſe the ſucceſſion of ſounds may be conformed.

Practical muſic is likewiſe divided into two departments, which correſpond to the two proceeding.

That which anſwers to *harmonical* muſic, and which the ancients called *melopée*, teaches the rules for combining and varying the intervals, whether conſonant or diſſonant, in an agreeable and harmonious manner.

The ſecond, which anſwers to the *rhythmical* muſic, and which they called *rhythmopée*, contains the rules for applying the different modes of time, for underſtanding the feet by which verſes were ſcanned, and the diverſities of meaſure; in a word, for the practice of the rythmus.

Muſic is at preſent divided more ſimply into *melody* and *harmony*; for ſince the introduction of *harmony* the proportion between the length and ſhortneſs of ſounds, or even that between the diſtance of returning cadences, are of leſs conſequence amongſt us. For it often happens in modern languages, that the verſes aſſume their meaſures from the muſical air and almoſt entirely loſe the ſmall ſhare of proportion and quantity which in themſelves they poſſeſs.

By melody the ſucceſſions of ſound are regulated in ſuch a manner as to produce pleaſing airs. See Melody.

Harmony conſiſts in uniting to each of the ſounds, in a regular ſucceſſion, two or more different ſounds, which ſimultaneouſly ſtriking the ear ſooth it by their concurrence. See Harmony.

Muſic, accoring to Rouſſeau, may be, and perhaps likewiſe ought to be, divided into the *phyſical* and the *imitative*. The firſt is limited to the mere mechaniſm of ſounds, and reaches no farther than the external ſenſes. without carrying its impreſſions to the heart, and can produce nothing but corporeal ſenſations more or leſs agreeable. Such is the muſic of ſongs, of hymns, of all the airs which only conſiſt in combinations of melodious ſounds, and in general all muſic which is merely harmonious

It may, however be queſtioned, whether every ſound, even to the moſt ſimple, is not either by nature or by early and confirmed aſſociation, *imitative*. If we may truſt our own feelings, there is no ſuch thing in nature as muſic which gives mechanical pleaſure alone. For if ſo, it muſt give ſuch pleaſure as we receive from taſtes, from odours, or from other grateful titillations; but we abſolutely deny that there are any muſical ſenſations or pleaſures in the ſmalleſt degree analogous to theſe. Let any piece of muſic be reſolved into its elementary parts and their proportions, it will then eaſily appear from this analyſis that ſenſe is no more than the vehicle of ſuch perceptions, and that mind alone can be ſuſceptible of them. It may indeed happen from the number of the performers and the complication of the harmony, that meaning and ſentiment may be loſt in the multiplicity of ſounds; but this, though it may be harmony, loſes the name of *muſic*.

The ſecond department of this diviſion, by lively and accentuated inflections, and by ſounds which may be ſaid to ſpeak, expreſſes all the paſſions, paints every poſſible picture, reflects every object, ſubjects the whole of nature to its ſkilful imitations, and impreſſes even on the heart and ſoul of man ſentiments proper to affect them in the moſt ſenſible manner. This, continues he, which is the genuine lyric and theatrical muſic, was what gave double charms and energy to ancient poetry; this is what, in our days, we exert ourſelves in applying to the drama, and what our ſingers execute on the ſtage. It is in this muſic alone, and not in harmonics or the reſonance of nature, that we muſt expect to find accounts of thoſe prodigious effects which it formerly produced.

But, with M. Rouſſeau's permiſſion, all muſic which is not in ſome degree characteriſed by theſe pathetic and imitative powers, deſerves no better name than that of a *muſical jargon*, and can only be effectuated by ſuch a complication and intricacy of harmony, as may confound, but cannot entertain the audience. This character therefore, ought to be added as eſſential to the definition of muſic; and it muſt be attributed to our neglect of this alone, whilſt our whole attention is beſtowed on harmony and execution, that the beſt performances of our artiſts and compoſers are heard with liſtleſs indifference and oſcitation, nor even can conciliate any admirers, but ſuch as are induced, by pedantry and affectation, to pretend what they do not feel. Still may the curſe of indifference and inattention purſue and harrow up the ſouls of every compoſer or performer, who pretends to regale our ears with this muſical legerdemain, till the grin of ſcorn, or the hiſs of infamy, teach them to correct this depravity of taſte, and entertain us with the voice of nature!

Whilſt moral effects are ſought in the natural effects of ſound alone, the ſcrutiny will be vain, and diſputes will be maintained without being underſtood: but ſounds, as repreſentatives of objects, whether by nature or aſſociation, introduce new ſcenes to the fancy and new feelings to the heart; not from their mechanical powers, but from the connection eſtabliſhed by the author of our frame between ſounds and the objects which either by natural reſemblance or unavoidable aſſociation they are made to repreſent.

It would ſeem that muſic was one of thoſe arts which were firſt diſcovered: and that vocal was prior to inſtrumental muſic, if, in the earlieſt ages there was any muſic which could be ſaid to be purely inſtrumental. For it is more than probable, that muſic was originally formed to be the vehicle of poetry; and of conſequence, though the voice might be ſupported and accompanied by inſtruments, yet muſic was never intended for inſtruments alone.

We are told by ancient authors, that all the laws, whether human or divine, exhortations to virtue, the knowledge of the characters and actions of gods and heroes, the lives and atchievments of illuſtrious men were written in verſe, and ſung publicly by a quire to the ſound of inſtruments; and it appears from the Scriptures, that ſuch from the earlieſt times was the cuſtom among the Iſraelites. Nor was it poſſible to find means more efficacious for impreſſing on the mind of man the principles of morals, and inſpiring the love of virtue. Perhaps, however, this was not the reſult of a premeditated plan; but inſpired by ſublime ſentiments and elevation of thought, which in accents that were ſuited and proportioned to their celeſtial nature endeavoured to find a language worthy of themſelves and expreſſive of their grandeur.

It merits attention, that the ancients were duly ſenſible of the value and importance of this divine art, not only as a ſymbol of that univerſal order and ſymmetry which prevails through the whole frame of material and intelligent nature, but as productive of the moſt momentous effects both in moral and political life. Plato and Ariſtotle, who diſagreed almoſt in every other maxim of politics, are unanimous in their approbation of muſic, as an efficacious inſtrument in the formation of the public character and in conducting the ſtate; and it was the general opinion, that whilſt the gymnaſtic exerciſes rendered the conſtitution robuſt and hardy, muſic humaniſed the character, and ſoftened thoſe habits of roughneſs and ferocity by which men might otherwiſe have degenerated into ſavages. The gradations by which voices were exerted and tuned, by which the invention of one inſtrument ſucceeded to another, or by which the principles of muſic were collected and methodiſed in ſuch a manner as to give it the form of an art and the dignity of a ſcience, are topics ſo fruitful of conjecture and ſo void of certainty, that we muſt leave them to employ minds more ſpeculative and inventions more prolific than ours, or transfer them to the *Hiſtory* of Muſic as a more proper place for ſuch diſquiſitions. For the amuſement of the curious, Rouſſeau in his *Muſical Dictionary*, Plates C and N, has tranſcribed ſome fragments of Grecian, Perſian, American, Chineſe, and Swiſs muſic, with which performers may entertain themſelves at leiſure. When they have tried the pieces, it is imagined they will be leſs ſanguinely fond than that author of aſcribing the power of muſic to its affinity with the national accents where it is compoſed. This may doubtleſs have its influence; but there are other cauſes more permanent and leſs arbitrary to which it owes its moſt powerful and univerſal charms.

The muſic now moſt generally celebrated and practiſed is that of the Italians, or their ſucceſsful imitatators. The Engliſh from the invaſion of the Saxons, to that more late though lucid era in which they imbibed the art and copied the manner of the Italians, had a muſic which neither pleaſed the ſoul nor charmed the ear. The primitive muſe of the French deſerves no higher panegyric. Of all the barbarous nations, the Scots and Iriſh ſeem to have poſſeſſed the moſt affecting original muſic. The firſt conſiſts of a melody characteriſed by tenderneſs: It melts the ſoul to a pleaſing penſive langour. The other is the native expreſſion of grief and melancholy. Taſſoni informs us, that in his time a prince from Scotland had imported into Italy a lamentable kind of muſic from his own country; and that he himſelf had compoſed pieces in the ſame ſpirit. From this expreſſive though laconic deſcription, we learn, that the character of our national muſic was even then eſtabliſhed; yet ſo groſs is our ignorance and credulity, that we aſcribe the beſt and moſt impaſſioned airs which are extent among us to David Rizzio; as if an Italian Lutaniſt, who had lived ſo ſhort a time in Scotland, could at once, as it were by inſpiration, have imbibed a ſpirit and compoſed in a manner ſo different from his own. It is yet more ſurpriſing that Geminiani ſhould have entertained and publiſhed the ſame prejudice, upon the miſerable authory of popular tradition alone; for the fact is authenticated by no better credentials. The primitive muſic of the Scots may be divided into the *martial*, the *paſtoral*, and the *feſtive*. The *firſt* conſiſts either in marches, which were played before the chieftains, in imitation of the battles which they fought, or in lamentations for the cataſtrophes of war and the extinction of families. Theſe wild effuſions of natural melody preſerve ſeveral of the rules preſcribed for compoſition. The ſtrains, though rude and untutored, are frequently terrible or mournful in a very high degree. The port or march is ſometimes in common, ſometimes in treble time; regular in its meaſures, and exact in the diſtance between its returning cadences; moſt frequently, though not always, loud and briſk. The *pibroch*, or imitation of battles, is wild, and abrupt in its tranſitions from interval to interval and from key to key; various and deſultory in its movements: frequent irregular in the return of its cadences; and in ſhort, through the whole, ſeems inſpired with ſuch fury and enthuſiaſm, that the hearer is irreſiſtibly infected with all the rage of precipitate courage, notwithſtanding the rudeneſs of the accents by which it is kindled. To this the *paſtoral* forms a ſtriking contraſt. Its accents are plaintive, yet ſoothing; its harmony generally flat; its modulations natural and agreeable; its rhythmus ſimple and regular; its returning cadences at equal diſtance; its tranſitions from one concinnous interval to another, at leaſt for the moſt part; its movements ſlow, and may be either in common or treble time. It ſcarcely admits of any other harmony than that of a ſimple baſs. A greater number of parts would cover the air and deſtroy the melody. To this we ſhall add what has been ſaid upon the ſame ſubject by Dr Franklin. Writing to Lord K——————, he proceeds thus:

"Give me leave, on this occaſion, to extend a little the ſenſe of your poſition, 'That melody and harmony are ſeparately agreeable, and in union delightful;' and to give it as my opinion, that the reaſon why the Scotch tunes have lived ſo long, and will probably live for ever (if they eſcape being ſtifled in modern affected ornament), is merely this, that they are really compoſitions of melody and harmony united, or rather that their melody is harmony. I mean, the ſimple tunes ſung by a ſingle voice. As this will appear paradoxical, I muſt explain my meaning. In common acceptation, indeed, only an agreeable *ſucceſſion* of ſounds is called *melody*; and only the *coexiſtence* of agreeable ſounds, *harmony*. But ſince the memory is capable of retaining for ſome moments a perfect idea of the pitch of a paſt ſound, ſo as to compare it with the pitch of a ſucceeding ſound, and judge truly of their agreement or diſagreement, there may and does ariſe from thence a ſenſe of harmony between the preſent and paſt ſounds, equally pleaſing with that between two preſent ſounds. Now the conſtruction of the old Scotch tunes is this, that almoſt every ſucceeding emphatical note is a third, a fifth, an octave, or in ſhort ſome note that is in concord with the preceding note. Thirds are chiefly uſed, which are very pleaſing concords. I uſe the word *emphatical*, to diſtinguiſh thoſe notes which have a ſtreſs laid on them in ſinging the tune, from the lighter connecting notes that ſerve merely, like grammar-articles in common ſpeech, to tack the whole together.

"That we have a moſt perfect idea of a ſound juſt paſt, I might appeal to all acquainted with muſic, who know how eaſy it is to repeat a ſound in the ſame pitch with one juſt heard. In tuning an inſtrument, a good ear can as eaſily determine that two ſtrings are in uniſon by ſounding them ſeparately, as by ſounding them together; their diſagreement is alſo as eaſily, I believe I may ſay more eaſily and better diſtinguiſhed when ſounded ſeparately; for when ſounded together, though you know by the beating that one is higher than the other, you cannot tell which it is. I have aſcribed to memory the ability of comparing the pitch of a preſent tone with that of one paſt. But if there ſhould be, as poſſibly there may be, ſomething in the ear ſimilar to what we find in the eye, that ability would not be entirely owing to memory. Poſſibly the vibrations given to the auditory nerves by a particular ſound may actually continue for ſome time after the cauſe of theſe vibrations is paſt, and the agreement or diſagreement of a ſubſeqnent ſound become by compariſon with them more diſcernible. For the impreſſion made on the viſual nerves by a luminous object will continue for 20 or 30 ſeconds."

After ſome experiments to prove the permanency of viſible impreſſions, he continues thus:

"Farther, when we conſider by whom theſe ancient tunes were compoſed, and how they were firſt performed, we ſhall ſee that ſuch harmonical ſucceſſions of ſounds was natural and even neceſſary in their conſtruction. They were compoſed by the minſtrels of thoſe days, to be played on the harp accompanied by the voice. The harp was ſtrung with wire, which gives a ſound of long continuance; and had no contrivance like that of the modern harpſichord, by which the ſound of the proceding note can be ſtopt the moment a ſucceeding note begins. To avoid actual diſcord, it was therefore neceſſary that the ſucceeding emphatic note ſhould be a cord with the preceding, as their ſounds muſt exiſt at the ſame time. Hence aroſe that beauty in thoſe tunes that has ſo long pleaſed, and will pleaſe for ever, though men ſcarce know why. That they were originally compoſed for the harp, and of the moſt ſimple kind, I mean a harp without any half-notes but thoſe in the natural ſcale, and with no more than two octaves of ſtrings, from C to C, I conjecture from another circumſtance; which is, that not one of theſe tunes, really ancient, has a ſingle artificial half-note in it; and that in tunes where it is moſt convenient for the voice to uſe the middle notes of the harp, and place the key in F, there the B, which if uſed ſhould be a B flat, is always omitted, by paſſing over it with a third. The connoiſſeurs in modern muſic will ſay I have no taſte: but I cannot help adding, that I believe our anceſtors, in having a good ſong, diſtinctly articulated, ſung to one of thoſe tunes, and accompanied by the harp, felt more real pleaſure than is communicated by the generality of modern operas, excluſive of that ariſing from the ſcenery and dancing. Moſt tunes of late compoſition, not having this natural harmony united with their melody, have recourſe to the artificial harmony of a baſs, and other accompanying parts. This ſupport, in my opinion, the old tunes do not need, and are rather confuſed than aided by it. Whoever has heard *James Oſwald* play them on his violincello, will be leſs inclined to diſpute this with me. I have more than once ſeen tears of pleaſure in the eyes of his auditors: and yet I think, even *his* playing thoſe tunes would pleaſe more if he gave them leſs modern ornament."

As theſe obſervations are for the moſt part true and always ingenious, we need no other apology for quoting them at length. It is only proper to remark, that the tranſition in Scots muſic by conſonant intervals, does not ſeem, as Dr Franklin imagines, to ariſe from the nature of the inſtruments upon which they played. It is more than probable, that the ancient Britiſh harp was not ſtrung with wire, but with the ſame materials as the Welch harps at preſent. Theſe ſtrings have not the ſame permanency of tone as metal: ſo that the ſound of a preceding emphatic note muſt have expired before the ſubſequent accented note could be introduced. Beſides, they who are acquainted with the manœuvre of the Iriſh harp, know well that there is a method of diſcontinuing ſounds no leſs eaſy and effectual than upon the harpſichord. When the performer finds it proper to interrupt a note, he has no more to do but return his finger gently upon the ſtring immediately ſtruck, which effectually ſtops its vibration.

That ſpecies of Scots muſic which we have diſtinguiſhed by the name of *feſtive* ſeems now limited to reels and country-dances. Theſe may be either in common or treble time. They moſt frequently conſiſt of two ſtrains: each of theſe contains eight or twelve bars. They are truly rhythmical; but the mirth which they excite ſeems rather to be inſpired by the vivacity of the movement, than either by the force or variety of the melody. They have a manœuvre and expreſſion peculiar to themſelves, which it is impoſſible to deſcribe, and which can only be exhibited by good performers.

Thus far we have purſued the general idea of muſic. We ſhall, after the hiſtory, give a more particular detail of the ſcience from Monſieur D'Alembert.

HISTORY of MUSIC.

2
No accurate accounts of the ſtate of muſic in the earlieſt ages of the world.

MUSIC is capable of a variety ſo infinite, ſo greatly does the moſt ſimple differ from the moſt complex, and ſo multiplied are the degrees between theſe two extremes, that in no age could the incidents reſpecting that faſcinating art have been few or unintereſting. But, that accounts of theſe incidents ſhould have been handed down to us, ſcanty and imperfect, is no matter of ſurpriſe, when we recollect that the hiſtory of muſic is the hiſtory only of ſounds, of which writing is a very inadequate medium; and that men would long employ themſelves in the pleaſing exerciſe of cultivating muſic before they poſſeſſed either the ability or the inclination to record their exertions.

No accurate traces, therefore, of the actual ſtate of muſic, in the earlier ages of the world, can be diſcerned. Our ideas on the ſubject have no foundation firmer than conjecture and analogy.

It is probable, that among all barbarous nations ſome degree of ſimilarity is diſcernible in the ſtyle of their muſic. Neither will much difference appear during the firſt dawnings of civilization. But in the more advanced periods of ſociety, when the powers of the human mind are permitted without obſtacle to exert their native activity and tendency to invention, and are at the ſame time affected by the infinite variety of circumſtances and ſituations which before had no exiſtence, and which in one caſe accelerate, and in another retard; then that ſimilarity, once ſo diſtinguiſhable, gives place to the endleſs diverſity of which the ſubject is capable.

3
Muſic not the invention of any one man.

The practice of muſic being univerſal in all ages and all nations, it would be abſurd to attribute the invention of the art to any one man. It muſt have ſuffered a regular progreſſion, through infancy, childhood, and youth, before it could arrive at maturity. The firſt attempts muſt have been rude and artleſs; perhaps the firſt flute was a reed of the lake.

No nation has been able to produce proofs of antiquity ſo indiſputable as the Egyptians; it would be vain, therefore, to attempt tracing muſic higher than the hiſtory of Egypt.

4
Egyptian muſic.

By comparing the accounts of Diodorus Siculus and of Plato, there is reaſon to ſuppoſe, that in very ancient times the ſtudy of muſic in Egypt was confined to the prieſthood, who uſed it only on religious and ſolemn occaſions; that, as well as ſculpture, it was circumſcribed by law: that it was eſteemed ſacred, and forbidden to be employed on light or common occaſions; and that innovation in it was prohibited: but what the ſtyle or relative excellence of this very ancient muſic was, there are no traces by which we can form an accurate judgment. After the reigns of the Pharaohs, the Egyptians fell by turns under the dominion of the Ethiopians, the Perſians, the Greeks, and the Romans. By ſuch revolutions, the manners and amuſements of the people, as well as their form of government, muſt have been changed. In the age of the Ptolemies, the muſical games and conteſts inſtituted by thoſe monarchs were of Greek origin, and the muſicians who performed were chiefly Greek.

The moſt ancient monuments of human art and induſtry, at preſent extant at Rome, are the obeliſks brought thither from Egypt, two of which are ſaid to have been erected by Seſoſtris at Heliopolis, about 400 years before the ſiege of Troy. Theſe were by the order of Auguſtus brought to Rome after the conqueſt of Egypt. One of them called *guglia rotta*, or the broken pillar, which during the ſacking of the city in 1527 was thrown down and broken, ſtill lies in the Campus Martius. On it is ſeen the figure of a muſical inſtrument of two ſtrings, and with a neck. It reſembles much the calaſcione ſtill uſed in the kingdom of Naples.

5
An Egyptian muſical inſtrument.

This curious relict of antiquity is mentioned, becauſe it affords better evidence than, on the ſubject of ancient muſic, is uſually to be met with, that the Egyptians, at ſo very early a period of their hiſtory, had advanced to a conſiderable degree of excellence in the cultivation of the arts. By means of its neck, this inſtrument was capable, with only two ſtrings, of producing a great number of notes. Theſe two ſtrings, if tuned fourths to each other, would furniſh that ſeries of ſounds called by the ancients *heptachord*, which conſiſts of a conjunct tetrachord as B, C, D, E; E, F, G, A; if tuned fifths, they would produce an octave, or two disjunct tetrachords. The calaſcione is tuned in this laſt manner. The annals of no nation other than Egypt, for many ages after the period of the obeliſk at Heliopolis, exhibit the veſtige of any contrivance to ſhorten ſtrings during performance by a neck or finger board. Father Montfaucon obſerves, that after examining 500 ancient lyres, harps, and citharas, he could diſcover no ſuch thing.

Egypt indeed ſeems to have been the ſource of human intelligence, and the favourite reſidence of genius and invention. From that celebrated country did the Greeks derive their knowledge of the firſt elements of thoſe arts and ſciences in which they afterwards ſo eminently excelled. From Greece again did the Romans borrow their attainments in the ſame purſuits. And from the records of thoſe different nations have the moderns been enabled to accompliſh an improvement ſo wonderful in literature.

6
The Egyptian Hermes the inventor of the lyre.

The Hermes or Mercury of the Egyptians, ſirnamed *Triſmegiſtus*, or *thrice illuſtrious*, who was, according to Sir Iſaac Newton, the ſecretary of Oſiris, is celebrated as the inventor of muſic. It has already been obſerved, that no one perſon ought ſtrictly to be called the inventor of an art which ſeems to be natural to, and coeval with, the human ſpecies; but the Egyptian Mercury is without doubt intitled to the praiſe of having made ſtriking improvements in muſic, as well as of having advanced in various reſpects the civilization of the people, whoſe government was chiefly committed to his charge. The account given by Apollodorus of the manner in which he accidentally invented the lyre, is at once entertaining and probable, "The Nile (ſays Apollodorus), after having overflowed the whole country of Egypt, when it returned within its natural bounds, left on the ſhore a great number of dead animals of various kinds, and among the reſt a tortoiſe; the fleſh of which being dried and waſted by the ſun, nothing remained within the ſhell but nerves and cartilages, and theſe being braced and contracted by the drying heat became ſonorous. Mercury, walking along the banks of the Nile, happened to ſtrike his foot againſt this ſhell; and was ſo pleaſed with the ſound produced, that the idea of a lyre ſtarted into his imagination. He conſtructed the inſtrument in the form of a tortoiſe, and ſtrung it with the dried ſinews of dead animals."

How beautiful to conceive the energetic powers of the human mind in the early ages of the world, exploring the yet undiſcovered capabilities of nature, and directed to the inexhauſtible ſtore by the finger of God, in the form of accident!

7
The ſingle flute of Egyptians.

The monaulos, or ſingle flute, called by the Egyptians photinx, was probably one of the moſt ancient inſtruments uſed either by them or any other nation. From various remains of ancient ſculpture, it appears to have been ſhaped like a bull's horn, and was at firſt, it may be ſuppoſed, no other than the horn itſelf.— Before the invention of flutes, as no other inſtrument except thoſe of percuſſion were known, muſic muſt have been little more than metrical. When the art of refining and lengthening ſounds was firſt diſcovered, the power of muſic over mankind, from the agreeable ſurpriſe occaſioned by ſoft and extended notes, was probably irreſiſtible. At a time when all the reſt of the world was involved in ſavage ignorance, the Egyptians were poſſeſſed of muſical inſtruments capable of much variety and expreſſion---Of this the aſtoniſhing remains of the city Thebes ſtill ſubſiſting afford ample evidence. In a letter from Mr Bruce, ingroſſed in Dr Burney's Hiſtory of Muſic, there is given a particular deſcription of the Theban harp, an inſtrument of extenſive compaſs, and exquiſite elegance of form. It is accompanied with a drawing taken from the ruins of an ancient ſepulchre at Thebes, ſuppoſed by Mr Bruce to be that of the father of Seſoſtris.

8
The Theban harp of Bruce.

On the ſubject of this harp, Mr Bruce makes the following ſtriking obſervation. "It overturns all the accounts of the earlieſt ſtate of ancient muſic and inſtruments in Egypt, and is altogether, in its form, ornaments, and compaſs, an inconteſtible proof, ſtronger than a thouſand Greek quotations, that geometry, drawing, mechanics, and muſic, were at the greateſt perfection when this harp was made; and that what we think in Egypt was the invention of arts was only the beginning of the æra of their reſtoration."

Indeed, when the beauty and powers of this harp, along with the very great antiquity of the painting which repreſents it, are conſidered, ſuch an opinion as that which Mr Bruce hints at, does not ſeem to be devoid of probability.

It cannot be doubted that during the reigns of the Ptolemies, who were voluptuous princes, muſic muſt have been much cultivated and encouraged. The father of Cleopatra, who was the laſt of that race of kings, derived his title of auletes, or flute-player, from his exceſſive attachment to the flute. Like Nero he uſed to array himſelf in the dreſs of a tibicen, and exhibit his performance in the public muſical conteſts.

Some authors, particularly Am. Marcellinus and M. Pau, refuſe to the Egyptians, at any period of their hiſtory, any muſical genius, or any excellence in the art; but the arguments uſed to ſupport this opinion ſeem to be inconcluſive, aud the evidences of the oppoſite deciſion appear to be inconteſtible.

9
Hebrew muſic.

The ſacred Scriptures afford almoſt the only materials from which any knowledge of Hebrew muſic can be drawn. In the rapid ſketch, therefore, of an ancient muſic which we mean to exhibit, a very few obſervations are all which can properly be given to that department of our ſubject.

Moſes, who led the Iſraelites out of Egypt, was educated by Pharaoh's daughter in all the literature and elegant arts cultivated in that country. It is probable, therefore, that the taſte and ſtyle of Egyptian muſic would be infuſed in ſome degree into that of the Hebrews. Muſic appears to have been interwoven through the whole tiſſue of religious ceremony in Paleſtine. The prieſthood ſeem to have been muſicians hereditarily and by office. The prophets appear to have accompanied their inſpired effuſions with muſic; and every prophet, like the preſent improviſatori of Italy, ſeems to have been accompanied by a muſical inſtrument.

Muſic, vocal and inſtrumental, conſtituted a great part of the funeral ceremonies of the Jews. The pomp and expence uſed on theſe occaſions advanced by degrees to an exceſſive extent. The number of flute-players in the proceſſions amounted ſometimes to ſeveral hundreds, and the attendance of the gueſts continued frequently for 30 days †.

The Hebrew language abounds with conſonants, and has ſo few vowels, that in the original alphabet they had no characters. It muſt, therefore, have been harſh and unfavourable to muſic. Their inſtruments of muſic were chiefly thoſe of percuſſion; ſo that both on account of the language and the inſtruments, the muſic muſt have been coarſe and noiſy. The vaſt numbers of performers too, whom it was the taſte of the Hebrews to collect together, could with ſuch language and ſuch inſtruments produce nothing but clamour and jargon. According to Joſephus, there were 200,000 muſicians at the dedication of Solomon's temple. Such are the circumſtances from which only an idea of Hebrew muſic can be formed; for the Jews neither ancient nor modern have ever had any characters peculiar to muſic; and the melodies uſed in their religious ceremonies have at all times been entirely traditional.

10
coarſe and noiſy.

11
Grecian muſic.

Cadmus, with the Phœnician colony which he led into Greece, imported at the ſame time various arts into that country. By the aſſiſtance of his Phœnician artificers, that chief diſcovered gold in Thrace and copper at Thebes. At Thebes that metal is ſtill termed *cadmia*. Of theſe materials, and of iron, they formed to themſelves armour and inſtruments of war. Theſe they ſtruck againſt each other during their dances at ſacrifices, by which they firſt obtained the idea of muſic. Such is the account given of the origin of that ſpecies of muſic in Greece produced by inſtruments of percuſſion. The invention of wind inſtruments in Greece is attributed to Minerva; and to the Grecian Mercury is aſſigned, by the poets and hiſtorians of that country, the honour of many diſcoveries probably due to the Egyptian Hermes, particularly the invention of ſtringed inſtruments. The lyre of the Egyptian Mercury had only three ſtrings; that of the Grecian ſeven: the laſt was perhaps no more than an improvement on the other. When the Greeks deified a prince or hero of their own country, they uſually aſſigned him an Egyptian name, and with the name beſtowed on their new divinity all the actions, attributes, and rites of the original.

The Grecian lyre, although ſaid to have been invented by Mercury, was cultivated principally by Apollo, who firſt played upon it with method, and accompanied it with the voice. The celebrated conteſt between him and Marſyas is mentioned by various authors; in which, by conjoining the voice with his lyre (a combination never before attempted), his muſic was declared ſuperior to the flute of Marſyas. The progreſs of the lyre, according to Diodorus Siculus, is the following. "The muſes added to the Grecian lyre the ſtring called *meſe*; Linus that of lichanos; and Orpheus and Thamyras thoſe ſtrings which are named hypate and parhypate." It has been already mentioned, that the lyre invented by the Egyptian Mercury had but three ſtrings; by putting theſe circumſtances together, we may perhaps acquire ſome knowledge of the progreſs of muſic, or at leaſt of the extenſion of its ſcale in the higheſt antiquity. *Meſe*, in the Greek muſic, is the fourth ſound of the ſecond tetrachord

12
Progreſs of the Grecian lyre.

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† Joſephus, L. 3. c. 9.

tetrachord of the great ſyſtem and firſt tetrachord invented by the ancients, anſwering to our A, on the fifth line in the baſe. If this ſound then was added to the former three, it proves that the moſt ancient tetrachord was that from E in the baſe to A; and that the three original ſtrings in the Mercurian and Apollonian lyre were tuned E, F, G, which the Greeks call *hypate meſon*, *parhypate meſon*, and *meſon diatonos*; the addition, therefore, of *meſe* to theſe completed the firſt and moſt ancient tetrachord E, F, G, A. The ſtring lichanos again being added to theſe, and anſwering to our D on the third line in the baſe, extended the compaſs downwards, and gave the ancient lyre a regular ſeries of five ſounds. The two ſtrings hypate and parhypate, correſponding with our B and C in the baſe, completed the heptachord or ſeven ſounds b, c, d, e, f, g, a; a compaſs which received no addition till after the days of Pindar.

It might perhaps be expected, that in a hiſtory of Greek muſic ſomething ought to be ſaid concerning the muſes Apollo, Bacchus, and the other gods and demi-gods, who in the mythology of that country appear to have promoted and improved the art. But ſuch a diſcuſſion would be too diffuſive, and involve too much foreign matter for the plan we have choſen to adopt. We cannot avoid, however, making a few obſervations on the poems of Homer, in ſo far as connected with our ſubject. It has been imagined, with much appearance of probability, that the occupation of the firſt poets and muſicians of Greece reſembled that of the Celtic and German bards and the ſcalds of Iceland and Scandinavia. They ſung their poems in the ſtreets of cities and in the palaces of princes. They were treated with high reſpect, and regarded as inſpired perſons. Such was the employment of Homer. His poems, ſo juſtly celebrated, exhibit the moſt authentic picture that can be found in the annals of antiquity, although perhaps ſomewhat highly coloured, of the times of which he wrote and in which he lived. Muſic is always named throughout the Iliad and Odyſſey with rapture; but as in theſe poems no mention is made of inſtrumental muſic unaccompanied with poetry and ſinging, a conſiderable ſhare no doubt of the poet's praiſes is to be attributed to the poetry. The inſtruments moſt frequently named are the lyre, the flute, and the ſyrinx. The trumpet appears not to have been known at the ſiege of Troy, although it had come to be in uſe in the days of Homer himſelf. From the time of Homer till that of Sappho, there is almoſt a total blank in literature. Only a few fragments remain of the works of thoſe poets and muſicians whoſe names are preſerved as having flouriſhed between thoſe periods (†). During the century which elapſed between the days of Sappho and thoſe of Anacreon, no literary productions are preſerved entire.— From Anacreon to Pindar there is another chaſm of near a century. Subſequent to this time, the works ſtill extant of the three great tragic poets, Æſchylus, Sophocles, and Euripides, together with thoſe of Plato, Ariſtotle, Ariſtoxenus, Euclid, Theocritus, Callimachus, Polybius, and many others, produced all within a ſpace leſs than 300 years, diſtinguiſh this illuſtrious and uncommon period as that in which the whole powers of genius ſeem to have been exerted to illuminate and inſtruct mankind in future ages. Then it was that eloquence, poetry, *muſic*, architecture, hiſtory, painting, ſculpture, like the ſpontaneous bloſſoms of nature, flouriſhed without the appearance of labour or of art.

13 Occupation of the firſt poets and muſicians in Greece.

The poets, as well epic as lyric and elegiac, were all likewiſe muſicians; ſo ſtrictly connected were muſic and poetry for many ages. It would afford amuſement to collect the biographical anecdotes of theſe favourites of genius, and to aſſign to each the reſpective improvements made by him in muſic and poetry; but our limits do not admit of ſo extenſive a diſquiſition; for which, therefore, reference muſt be made to the editors and commentators of theſe authors, and to the voluminous hiſtories of muſic lately publiſhed.

14 The invention of muſical characters.

The invention of notation and muſical characters marked a diſtinguiſhed æra in the progreſs of muſic. There are a diverſity of accounts reſpecting the perſon to whom the honour of that invention is due; but the evidences ſeem to preponderate in favour of Terpander, a celebrated poet and muſician, to whoſe genius muſic is much indebted. He flouriſhed about the 27th Olympiad, or 671 years before Chriſt.

Before that valuable diſcovery, muſic being entirely traditional, muſt have depended much on the memory and taſte of the performer.

15 Vociferous muſic of the Greeks.

There is an incident mentioned in the accounts handed down to us of the Olympic games, which may ſerve in ſome degree to mark the character of muſic at the time in which it happened. Lucian relates that a young flute-player named Harmonides, at his firſt public appearance in theſe games, began a ſolo with ſo violent a blaſt, on purpoſe to *ſurpriſe* and *elevate* the audience, that he *breathed his laſt breath into his flute*, and died on the ſpot. When to this anecdote, wonderful to us, and almoſt incredible, is added the circumſtance, that the trumpet-players at theſe public exhibitions expreſſed an exceſs of joy when they found their exertions had neither rent their cheeks nor burſt their blood-veſſels, ſome idea may be formed of the noiſy and vociferous ſtyle of muſic which then pleaſed; and from ſuch facts only can any opinion be obtained of the actual ſtate of ancient muſic.

In whatever *manner* the flute was played on, there is no doubt that it was long in Greece an inſtrument of high favour, and that the flute-players were held in much eſtimation. The flute uſed by Iſmenias, a celebrated Theban muſician, coſt at Corinth three talents, or L.581. 5s. If, ſays Xenophon, a bad flute-player would paſs for a good one, he muſt, like the *great flute-players*, expend large ſums on *rich furniture*, and appear in public *with a great number of ſervants*.

16 Extravagance of the ancients with reſpect to muſic.

The ancients, it appears, were not leſs extravagant in gratifying the miniſters of their pleaſures than ourſelves.

(†) Heſiod lived ſo near to Homer, that it has been diſputed which of them is the moſt ancient. It is now, we believe, univerſally admitted, that the palm of antiquity is due to Homer; but we conſider them as having both flouriſhed in the ſame æra.

ſelves. Amœbeus, a harper, was paid an Attic talent, or L.193, 15s. *per* day for his performance (‡).

It is proper to add, that the celebrated muſicians of Greece who performed in public were of *both* ſexes; and that the beautiful Lamia, who was taken captive by Demetrius, in the ſea engagement in which he vanquiſhed Ptolemy Soter, and who herſelf captivated her conqueror, as well as many other elevated female ſpirits, are recorded by ancient authors in terms of admiration, and of whom, did our limits here admit of biography, we would treat with pleaſure. The philoſophers of Greece, whoſe capacious minds graſped every other object of human intelligence, were not inattentive to the theory of muſic, or the philoſophy of ſound. This department of ſcience became the ſource of various ſects, and of much diverſity of opinion.—The founders of the moſt diſtinguiſhed ſects were Pythagoras and Ariſtoxenus. Of their theories, mention is made in the Appendix to this article.

17
Roman muſic.

Like every other people, the Romans, from their firſt origin as a nation, were poſſeſſed of a ſpecies of muſic which might be diſtinguiſhed as their own. It appears to have been rude and coarſe, and probably was a variation of the muſic in uſe among the Etruſcans and other tribes around them in Italy: but as ſoon as they began to open a communication with Greece, from that country, with their arts and philoſophy, they borrowed alſo their muſic and muſical inſtruments. No account, therefore, of Roman muſic is to be expected that would not be a repetition of what has been ſaid on the ſubject of the muſic of Greece.

18
Vanity of Nero with reſpect to muſic.

The exceſſive vanity of Nero with reſpect to muſic, diſplayed in his public contentions for ſuperiority with the moſt celebrated profeſſors of the art in Greece and Rome, is known to every one converſant in the hiſtory of Rome. The ſolicitude with which that deteſtable tyrant attended to his voice is curious, and will throw ſome light on the practices of ſingers in ancient times. He was in uſe to lie on his back, with a thin plate of lead on his ſtomach. He took frequent emetics and cathartics, abſtained from all kinds of fruit and ſuch meats as were held to be prejudicial to ſinging. Apprehenſive of injuring his voice, he at length deſiſted from haranguing the ſoldiery and the ſenate; and after his return from Greece eſtabliſhed an officer (Phonaſcus) to regulate his tones in ſpeaking.

19
Sacred muſic.

Moſt nations have concurred in introducing muſic into their religious ceremonies. That art was early admitted into the rites of the Egyptians and Hebrews; and that it conſtituted a conſiderable part of the Grecian and Roman religious ſervice, appears from the writings of many ancient authors. The ſame pleaſing art ſoon obtained an introduction into the Chriſtian church, as the Acts of the Apoſtles diſcover in many paſſages. There remain no ſpecimens of the muſic employed in the worſhip of the primitive Chriſtians; but probably it was at firſt the ſame with that uſed in the Pagan rites of the Greeks and Romans. The practice of chanting the pſalms was introduced into the weſtern churches by St Ambroſe, about 370 years after Chriſt. In the year 600, the method of chanting was improved by St Gregory the Great. The Ambroſian chant contained four modes. In the Gregorian the number was doubled. So early as the age of Conſtantine the Great, prior to either of the periods laſt mentioned, when the Chriſtian religion firſt obtained the countenance of power, inſtrumental muſic came to be introduced into the ſervice of the church. In England, according to biſhop Stillingfleet, muſic was employed in the church-ſervice, firſt by St Auguſtine, and afterwards much improved by St Dunſtan, who was himſelf an eminent muſician, and who is ſaid to have firſt furniſhed the Engliſh churches and convents with the organ. The organ, the moſt majeſtic of all inſtruments, ſeems to have been an improvement of the hydraulican or water organ of the Greeks.—The firſt organ ſeen in France was ſent from Conſtantinople in 757, as a preſent to king Pepin from the emperor Conſtantine Copromymus VI. In Italy, Germany, and England, that inſtrument became frequent during the 10th century.

20
Introduced into the Engliſh church.

During the dark ages no work of genius or taſte in any department of ſcience ſeems to have been produced in any part of Europe; and except in Italy, where the cultivation of muſic was rather more the object of attention, that art was neglected equally with all others. There has always been obſerved a correſpondence in every country between the progreſs of muſic and the cultivation of other arts and ſciences. In the middle ages, therefore, when the moſt fertile provinces of Europe were occupied by the Goths, Huns, Vandals, and other barbarous tribes, whoſe language was as harſh as their manners were ſavage, little perfection and no improvement of muſic is to be looked for. Literature, arts, and refinements, were encouraged more early at the courts of the Roman pontiffs than in any other country; and owing to that circumſtance it is, that the ſcale, the counterpoint, the beſt melodies, the dramas religious and ſecular, the chief graces and elegancies of modern muſic, have derived their origin from Italy. In modern times, Italy has been to the reſt of Europe what ancient Greece was to Rome. The Italians have aided the civilization of their conquerors, and enlightened the minds of thoſe whoſe ſuperior proweſs had enſlaved them.

21
The great improvements in muſic had their origin in Italy.

Having mentioned counterpoint, it would be improper not to make one or two obſervations on an invention which is ſuppoſed to have been the ſource of great innovation in the practice of muſic. Counterpoint, or muſic in parts, ſeems to be an invention purely modern. The term harmony meant in the language of antiquity what is now underſtood by melody. Guido, a monk of Arezzo in Tuſcany, is, in the general opinion, ſuppoſed to have entertained the firſt idea of counterpoint about the year 1022: an art which, ſince his time, has experienced gradual and imperceptible improvements, far exceeding the powers or comprehenſion of any one individual. The term *counterpoint*, or *contra punctum*, denotes its own etymology and import. Muſical notes were at one time performed by ſmall points; and the preſent mode is only

21
Counterpoint.

(‡) Roſcius gained 500 Seſtertia, or L.4036 : 9 : 2 d. Sterling *per annum*.

only an improvement of that practice. Counterpoint, therefore, denotes the notation of harmony or muſic in parts, by points oppoſite to each other. The improvements of this important acquiſition to the art of muſic kept pace at firſt with thoſe of the organ; an inſtrument admirably adapted to harmony: And both the one and the other were till the 13th century employed chiefly in ſacred muſic. It was at this period that ſecular muſic began to be cultivated.

Before the invention of characters for time, muſic in parts muſt have conſiſted entirely of *ſimple counterpoint*, or note againſt note, as it is practiſed in pſalmody. But the happy diſcovery of a time-table extended infinitely the powers of combined ſounds. The ancients had no other reſource to denote time and movement in muſic except two charcters (— ⏑), equivalent to a long and a ſhort ſyllable. But time is of ſuch importance in muſic, that it can impart meaning and energy to the repetition of the ſame ſound: without it variety of tones has no effect with

22 The invention of the time table.

reſpect to gravity and acuteneſs. The invention of the time-table is attributed by almoſt all the writers on muſic of the laſt and preſent century to John de Muris, who flouriſhed about the year 1330. But in a manuſcript of John de Muris himſelf, bequeathed to the Vatican library by the Queen of Sweden, that honour ſeems to be yielded to Magiſter Franco, who appears to have been alive as late at leaſt as 1083. John de Muris, however, who there is ſome reaſon to believe was an Engliſhman, though not the inventor of the *cantus menſurabilis*, did certainly by his numerous writings greatly improve it. His tract on the *Art of Counterpoint* is the moſt clear and uſeful eſſay on the ſubject of which thoſe times can boaſt.

In the 11th century, during the firſt cruſade, Europe began to emerge from the barbarous ſtupidity and ignorance which had long overwhelmed it. While its inhabitants were exerciſing in Aſia every ſpecies of rapine and pious cruelty, art, ingenuity, and reaſon, inſenſibly civilized and ſoftened their minds. Then it

23 Troubadours.

was that the poets and ſongſters, known by the name of *Troubadours*, who firſt appeared in Provence, inſtituted a new profeſſion; which obtained the patronage of the count of Poictou, and many other princes and barons who had themſelves cultivated muſic and poetry with ſucceſs. At the courts of their munificent patrons the troubadours were treated with reſpect. The ladies, whoſe charms they celebrated, gave them the moſt generous and flattering reception. The ſucceſs of ſome inſpired others with hopes, and excited exertions in the exerciſe of their art; impelling them towards perfection with a rapidity which the united force alone of emulation and emolument could occaſion. Theſe founders of modern verſification, conſtructing their ſongs on plans of their own, claſſical authority, either through ignorance or deſign, was entirely diſregarded. It does not appear, however, during the cultivation and favour of Provençal literature, that any one troubadour ſo far outſtripped the reſt as to become a model of imitation. The progreſs of taſte muſt ever be impeded by the ignorance and caprice of thoſe who cultivate an art without ſcience or principles.

During almoſt two centuries after the arrangement of the ſcale attributed to Guido, and the invention of the time table aſcribed to Franco, no remains of ſecular muſic can be diſcovered, except thoſe of the troubadours or Provençal poets. In the ſimple tunes of theſe bards no time indeed is marked, and but little variety of notation appears; it is not difficult, however, to diſcover in them the germs of the future melodies, as well as the poetry of France and Italy. Had the poetry and muſic of the troubadours been treated of in an agreeable manner by the writers who have choſen that ſubject, it would have been diſcovered to be worthy of attention; the poetry, as intereſting to literatue; the melody to which it was ſung, as curious to the muſical hiſtorian.—Almoſt every ſpecies of Italian poetry is derived from the Provençals. *Air*, the moſt captivating part of ſecular vocal muſic, ſeems to have had the ſame origin. The moſt ancient ſtrains that have been ſpared by time, are ſuch as were ſet to the ſongs of the troubadours. The Provençal language began to be in favour with poets about the end of the 10th century. In the 12th it became the general vehicle, not only of poetry, but of proſe, to all who were ignorant of Latin. And theſe were not the laity only. At this period *violars*, or performers on the vielle or viol, *juglars* or flute-players, *muſars* or players on other inſtruments, and *comics* or comedians, abounded all over Europe. This ſwarm of poet-muſicians, who were formerly comprehended in France under the general titles of *jongleurs*, travelled from province to province ſinging their verſes at the courts of princes. They were rewarded with cloaths, horſes, arms, and money. Jongleurs or muſicians were employed often to ſing the verſes of troubadours, who themſelves happened to be deficient in voice or ignorant of muſic. The term *troubadour*, therefore, implies poetry as well as muſic. The jongleurs, menetriers, ſtrollers, or minſtrels, were frequently muſicians, without any pretenſions to poetry. Theſe laſt have been common at all times, but the troubadour or bard has diſtinguiſhed a particular profeſſion, either in ancient or modern times, only during the early dawnings of literature.

In the 13th century the ſongs were on various ſubjects; moral, merry, amorous: and at that time melody ſeems to have been little more than plain ſong or chanting. The notes, were ſquare, and written on four lines only like thoſe of the Romiſh church in the cliff C, and without any marks for time. The movement and embelliſhments of the air depended on the abilities of the ſinger. Since that time, by the cultivation of the voice modern muſic has been much extended, for it was not till towards the end of St Lewis's reign that the fifth line began to be added to the ſtave. The ſinger always accompanied himſelf with an inſtrument in uniſon.

24 The harp the favourite inſtrument of the troubadours.

As the lyre is the favourite inſtrument in Grecian poetry, ſo the harp held the ſame place in the eſtimation of the poets who flouriſhed in the period of which we at preſent ſpeak. A poet of the 14th century, Machau, wrote a poem on the ſubject of the harp alone, in which he aſſigns to each of its 25 ſtrings an allegorical name; calling one *liberality*, another *wealth*, &c.

25 The viol or violin.

The inſtrument which frequently accompanied, and indeed diſputed the pre-eminence with the harp, was the viol. Till the 16th century this inſtrument was furniſhed with frets; after that period it was reduced to four ſtrings: and ſtill under the denomination of *violin* holds the firſt place among treble inſtruments. The viol was played with a bow, and differed entirely from the vielle, the tones of which were produced by the friction of a wheel; the wheel performed the part of a bow.

Britiſh harpers were famous long before the conqueſt. The bounty of William of Normandy to his *joculator* or bard is recorded in the doomſday book. The harp ſeems to have been the favourite inſtrument in Britain for many ages, under the Britiſh, Saxon, Daniſh, and Norman kings. The *fiddle*, however, is mentioned ſo early as 1200 in the legendary life of St Chriſtopher. The ancient privileges of the minſtrels at the fairs of Cheſter are well known in the hiſtory of England.

The extirpation of the bards of Wales by Edward I. is likewiſe too familiar an incident to be mentioned here. His perſecuting ſpirit, however ſeems to have been limited to that principality; for we learn, that at the ceremony of knighting his ſon, a *multitude of minſtrels* attended.

In 1315, during the reign of Edward II. ſuch extenſive privileges were claimed by the minſtrels, and ſo many diſſolute perſons aſſumed that character, that it became neceſſary to reſtrain them by expreſs laws.

26 St Cecilia. The father of our genuine poetry, who in the 14th century enlarged our vocabulary, poliſhed our numbers, and with acquiſitions from France and Italy augmented our ſtore of knowledge (Chaucer), entitles one of his poems The Hiſtory of St Cecilia; and the celebrated patroneſs of muſic muſt no doubt be mentioned in a hiſtory of the art. Neither in Chaucer, however, nor in any of the hiſtories or legendary accounts of this Saint, does any thing appear to authoriſe the religious veneration paid to her by the votaries of muſic; nor is it eaſy to diſcover whence it has ariſen. 27 Origin of the degree of Muſ. D. As an incident relative to the period of which we ſpeak, it may be mentioned, that, according to Spelmann, the appellation of *Doctor* was not among the degrees granted to graduates in England ſooner than the reign of King John, about 1207; although, in Wood's hiſtory of Oxford, that degree is ſaid to have been conferred, even in muſic, in the reign of Henry II. It is known that the title was created on the continent in the 12th century; and as, during the middle ages, muſic was always ranked among the ſeven liberal arts, it is likely that the degree was extended to it.

After the invention of printing, an art which has tended to diſſeminate knowledge with wonderful rapidity among mankind, muſic, and particularly counterpoint, became an object of high importance. The names of the moſt eminent compoſers who flouriſhed in England, from that time to the Reformation, were, Fairfax, William of Newark, Sheryngham, Turges, Baniſter, Tudor, Taverner, Tye, Johnſon, Parſons; to whom may be added John Marbeck, who ſet the whole Engliſh cathedral ſervice to muſic.

28 Scottiſh muſic. Before this period Scottiſh muſic had advanced to a high degree of perfection. James I. was a great compoſer of airs to his own verſes; and may be conſidered as the father of that plaintive melody which in Scotch tunes is ſo pleaſing to a taſte not vitiated by modern affectation. Beſides the teſtimony of *Fordun* and *Major*, who may be ſuſpected of being under the influence of national prejudice, we have that of Aleſſandro Taſſoni, to the muſical ſkill of that accompliſhed prince. "Among us moderns (ſays this foreigner) we may reckon *James king of Scotland*, who not only compoſed many ſacred pieces of vocal muſic, but alſo of himſelf *invented a new kind of muſic, plaintive and melancholy, different from all other*: in which he has *been imitated* by Carlo Geſueldo prince of Venoſa, who in our age has improved muſic with new and admirable inventions."

Under ſuch a genius in poetry and muſic as king James I. it cannot be doubted that the national muſic muſt have been greatly improved, We have ſeen that he compoſed ſeveral anthems, or vocal pieces of *ſacred muſic*, which ſhows that his knowledge of the ſcience muſt have been very conſiderable. It is likewiſe known, that organs were by him introduced into the cathedrals and abbeys of Scotland, and choir-ſervice brought to ſuch a degree of perfection, as to fall little ſhort of that eſtabliſhed in any country of Europe.—By an able antiquary † of the preſent age, the great era of muſic as of poetry, in Scotland, is ſuppoſed to have been from the beginning of the reign of James I. down to the end of the reign of James V. During that period flouriſhed *Gavin Douglas* biſhop of Dunkeld, *Ballenden* archdeacon of Murray, *Dunbar*, *Henryſon*, *Scott*, *Montgomery*, *Sir David Lindſey*, and many others, whoſe fine poems have been preſerved in Banatyne's Collection, and of which ſeveral have been publiſhed by Allan Ramſay in his *evergreen*.

Before the Reformation, as there was but one religion, there was but one kind of ſacred muſic in Europe, plain chant, and the deſcant built upon it.—That muſic likewiſe was applied to one language only, the Latin. On that account, the compoſitions of Italy, France, Spain, Germany, Flanders, and England, kept pace in a great degree with each other in ſtyle and excellence. All the arts ſeem to have been the companions, if not the produce, of ſucceſsful commerce, and to have purſued the ſame courſe. Like commerce, they appeared firſt in Italy, then in the Hanſeatic towns, next in the Netherlands; and during the 16th century, when commerce became general, in every part of Europe.

29 In the 16th century muſic an indiſpenſable part of education. In the 16th century muſic was an indiſpenſable part of polite education; all the princes of Europe were inſtructed in that art. There is a collection preſerved in manuſcript called *Queen Elizabeth's Virginal Book*. If her majeſty was able to execute any of the pieces in that book, ſhe muſt have been a great player; a month's practice would not be ſufficient for any maſter now in Europe to enable him to play one of them to the end. *Tallis*, ſingularly profound in muſical compoſition, and *Bird* his admirable ſcholar, were two of the authors of this famous collection.

During the reign of Elizabeth, the genus and learning of the Britiſh muſicians were not inferior to any on the continent; an obſervation ſcarcely applicable at any other period of the hiſtory of this country. Sacred muſic was the principal object of ſtudy all over Europe.

The moſt eminent muſical theoriſts of Italy, who flouriſhed in the 16th century, were, Franchinus Gaferius, or Gafforio of Lode, Pietro Aaron of Florence,

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† See Tytler's Diſſertation on the Scotch Muſic, vol. i. of Tranſactions of the Society of Antiquaries in Scotland.

30 Eminent muſicians in Italy during the 16th century.

[illegible] Lodovico, Fogliano, Giov. Spataro, Giov. Maria Lanfranco, Steffano Uanneo, Anton. [illegible] Done, Luigi Dentice, Nicolo Vicentino, and Gioſeffo Zarlino, the moſt general, voluminous, and celebrated theoriſt of that period.

Vincenzo Galilei, a Florentine nobleman, and father of the great Galileo Galilei.

Mario Artuſi of Bologna, Orafeo Tegrini, Pietro Pontio, and Lodovico Zacconi.

The principal Roman authors were, Giovanni Animuccia, Giovanni Pierluigi da Paleſtrina, juſtly celebrated; Ruggiero Giovanelli, Luca Marenzio, who brought to perfection madrigals, the moſt cheerful ſpecies of ſecular muſic.

Of the Venetians, Adrian Willaeri is allowed to be at the head.

At the head of the Neapolitans is deſervedly placed Rocco Rodio.

At Naples, too, the illuſtrious dilettante, Don Carlo Geſualdo prince of Venoſa, is highly celebrated. He ſeems, however, to have owed much of his fame to his high rank.

Lombardy would alſo furniſh an ample liſt of eminent muſicians during the 16th century, of whom our limits will not admit of a particular enumeration:—The chief of them were, Conſtanzo Porta, Gaſtoldi, Biffi, Cima, Vecchi, and Monteverde.

At Bologna, beſides Artuſi already mentioned, Andrea Rota of the ſame city appears to have been an admirable contrapunctiſt.

Franciſco Corteccia, a celebrated organiſt and compoſer, and Aleſſandro Strigglio, a lutaniſt and voluminous compoſer, were the moſt eminent Florentines.

31 In Germany.

The inhabitants of the extenſive empire of Germany have long made muſic a part of general education.—They hold the place, next Italy, among the moſt ſucceſsful cultivators of the art. During the 16th century, their moſt eminent compoſers of muſic and writers on the ſubject were, Geo. Reiſchius, Michael Roſwick, Andreas Ornithorparchus, Paul Hofhaimer; Luſpeinius, Henry Loris or Lorit, Faber, Fink, Hofman, and many others whom it would be tedious to mention; and for a particular account of whoſe treatiſes and compoſitions we muſt refer to more voluminous hiſtories of muſic.

32 In France.

In France, during the 16th century, no art except the art of war made much progreſs in improvement.—Ronſard, Baif, Goudimel, Claud le Jeune, Caurroy, and Maudit, are the chief French muſicians of that period.

33 Spain.

In Spain, muſic was early received into the circle of ſciences in the univerſities. The muſical profeſſorſhip at Salamanca was founded and endowed by Alforzo the Wiſe, king of Caſtile.

One of the moſt celebrated of the Spaniſh muſicians was Francis Salinas, who had been blind from his infancy. He was a native of Burgos.

D. Criſtofero Morales, and Tomaſo Lodovico da Vittorio, deſerve likewiſe to be mentioned; and to mention them is all we can attempt; the purpoſe of which is, to excite more minute inquiry by thoſe who may chooſe to inveſtigate the ſubject particularly.

34 The Netherlands.

The Netherlands, likewiſe, during the period of which we have been ſpeaking, produced many eminent compoſers; of whom we may mention Verdelot, Gombert, Arkadelt, Berchem, Richefort or Ricciafort, Crequilon Le Cock or Le Coq, Canis, Jacob Clemens Non Papa, Pierre Marcecourt, Button, Kerl, Rore, Orlando di Laſſo, and his ſons Ferdinand and Rodolph.

35 Muſical compoſers in England during the 17th century.

In the 17th century, the muſical writers and compoſers who acquired fame in England, were, Dr Nathaniel Giles, Thomas Tomkins, and his ſon of the ſame name; Elway Bevin, Orlando Gibbons, Dr William Child, Adrian Batten, Martin Pierſon, William Lawes, Henry Lawes, Dr John Wilſon, John Hilton, John Playford, Captain Henry Cook, Pelham Humphrey, John Blow, William Turner, Dr Chriſtopher Gibbons, Benjamin Rogers, and Henry Purcell. Of theſe, Orlando Gibbons, Pelham Humphrey, and Henry Purcell, far excelled the reſt.

About the end of the reign of James I. a muſic lecture or profeſſorſhip was founded in the univerſity of Oxford by Dr William Hychin.

In the reign of Charles I. a charter was granted to the muſicians of Weſtminſter, incorporating them, as the king's muſicians, into a body politic, with powers to proſecute and fine all who, except themſelves, ſhould "attempt to make any benefit or advantage of muſic in England or Wales:" powers which in the ſubſequent reign were put in execution.

About the end of the reign of Charles II. a paſſion ſeems to have been excited in England for the violin, and for pieces expreſsly compoſed for it, in the Italian manner (*). Prior to 1600, there was little other muſic except maſſes and madrigals, the two principal diviſions of ſacred and ſecular muſic; but from that time to the preſent, dramatic muſic becomes the chief object of attention. The muſic of the church and of the chamber continued indeed to be cultivated in Italy with diligence, and in a learned and elaborate ſtyle, till near the middle of the century; yet a revolution in favour of melody and expreſſion was preparing, even in ſacred muſic, by the ſucceſs of dramatic compoſition, conſiſting of recitation and melodies for a ſingle voice. Such melodies began now to be preferred to muſic of many parts; in which canons, fugues, and full harmony, had been the productions which chiefly employed the maſter's ſtudy and the hearer's attention.

36 Mean ſtate of the opera in the beginning of the preſent century.

So late as the beginning of the preſent century, according to Riccoboni, the performers in the operas of Germany, particularly at Hamburg, "were all tradeſmen or handicrafts; your ſhoemaker (ſays he) was often the firſt performer on the ſtage; and you might have bought fruit and ſweatmeats of the ſame girls,

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(*) The moſt celebrated violin players of Italy, from the 16th century to the preſent time, have been Farina, M. Angelo Roſſi, Baſſani the violin-maſter of Corelli, the admirable Angelico Corelli himſelf, Torelli, Alberti, Albenoni, Teſſarini, Vivaldi, Geminiani one of the moſt diſtinguiſhed of Corelli's ſcholars. Tartini, Veracini, Barbella, Locatelli, Ferrari, Martini, Poccherini, and Giardini.

girls, whom the night before you had ſeen in the characters of Armida or Semiramis. Soon, however, the German opera aroſe to a more reſpectable ſituation; and even during the 17th century many eminent compoſers flouriſhed in that country.

The number of great muſicians which France produced during the early part of the ſame century is not numerous. Muſic ſeems to have been but little cultivated in that country, till the operas of Lulli, under the powerful patronage of Louis XIV. excited public attention.

The favourite ſinging-maſter and compoſer of France, about the middle of the 17th century, was Michael Lambert. John Baptiſt Lulli, ſoon after this time, roſe from the rank of a menial ſervant to fame, opulence, and nobility, by his ſkill in muſical compoſitions. The celebrated ſinger La Rochois was taught ſinging and acting by Lulli.

37 Curious anecdotes of a French ſinger.

La Maupin the ſucceſſor of La Rochois, on account of her extraordinary character and romantic adventures, deſerves to be mentioned. She was equally fond of both ſexes, fought and loved like a man, reſiſted and fell like a woman. She eloped from her huſband with a fencing-maſter, of whom ſhe learnt the ſmall ſword; ſhe became an excellent fencer. At Marſeilles ſhe became enamoured of a young lady, whom ſhe ſeduced: on account of this whimſical affection the lady was by her friends confined in a convent. La Maupin obtained admiſſion into the ſame convent as a novice: ſhe ſet fire to the convent, and in the confuſion carried off her favourite. At Paris, when ſhe appeared on the ſtage in 1695, Dumeni a ſinger having affronted her, ſhe put on mens clothes, and inſiſted on his drawing his ſword and fighting her: when he refuſed, ſhe caned him, and took from him his watch and ſnuff-box as trophies of her victory. At a ball given by Monſieur brother of Louis XIV. ſhe again put on mens clothes; and having behaved impertinently to a lady, three of the lady's friends ſuppoſing La Maupin to be a man, called her out: ſhe killed them all, and returning quietly to the ball, told the ſtory to Monſieur, who obtained her pardon. She became afterwards miſtreſs to the elector of Bavaria. This prince quitting her for the counteſs of Arco, ſent her by the count, huſband of that lady, a purſe of L.40,000 livres: ſhe threw it at the count's head, telling him, it was a recompence [illegible] as himſelf. At laſt, ſeized with a fit of devotion, ſhe recalled her huſband, and paſſed the remainder of her life in piety. She died in 1707, at the age of 33.

38 [illegible]

The firſt great Engliſh muſician whom we ſhall mention was the celebrated Purcell: after his time the chief compoſers for the church were Clarke, Dr Holder, Dr Creyghton, Tucker, Aldrich, Golwin, Weldon, Dr Croft, Dr Greene, Boyce, and Handel; to whom may [illegible] who attained a high proficiency [illegible] years [illegible] acquired [illegible].

[illegible] have hitherto furniſh- [illegible] to the [illegible] of the art [illegible] dramatic melody; a [illegible] the manner of the ancient [illegible].

The Orpheo of Politian was the firſt attempt at muſical drama. It was afterwards perfected by Metaſtaſio. No muſical dramas ſimilar to thoſe afterwards known by the names of *opera* and *oratorio*, had exiſtence in Italy before the beginning of the 17th century. It was about the 1600, or a little before that time, that eunuchs were firſt employed for ſinging in Italy.

39 Firſt muſical drama.

40 Firſt ſinging eunuchs.

There ſeem to have been no *ſinging* eunuchs in ancient times, unleſs the galli or archigalli, prieſts of Cybele, were ſuch. Caſtration has, however, at all times been practiſed in eaſtern countries, for the purpoſe of furniſhing to tyrannic jealouſy guards of female chaſtity; but never, ſo far as modern writers on the ſubject have diſcovered, merely to preſerve the voice, till about the end of the 16th century.

At Rome, the firſt public theatre opened for the exhibition of muſical dramas, in modern times, was *il Torre di Nona*, where in 1671 Giaſone was performed. In 1679, the opera of *Dove è Amore*, ſet by the famous organiſt Bernardo Paſquini, was repreſented at *Della Sala de Signori Capranica*; a theatre which ſtill ſubſiſts. In the year 1680, *L'Oneſta nell'Amore* was exhibited; the firſt dramatic compoſition of the elegant, profound, and original Aleſſandro Scarlatti.

The inhabitants of Venice have cultivated and encouraged the muſical drama with more zeal and diligence than the reſt of Italy, during the end of the laſt and beginning of the preſent century; yet the opera was not eſtabliſhed in Venice before the year 1637; in that year the firſt regular drama was performed: it was Andromeda.

41 Opera of Berenice.

In 1680 the opera of Berenice was exhibited at Padua with ſuch aſtoniſhing ſplendour as to merit notice. There were choruſes of 100 virgins, 100 ſoldiers, 100 horſemen in iron armour, 40 cornets of horſe, 6 trumpeters on horſeback, 6 drummers, 6 enſigns, 6 ſackbuts, 6 great flutes, 6 minſtrels playing on Turkiſh inſtruments, 6 others on octave flutes, 6 pages, 3 ſerjeants, 6 cymbaliſts. There were 12 huntſmen, 12 grooms, 6 coachmen for the triumph, 6 others for the proceſſion, 2 lions led by two Turks, 2 elephants by two others; Berenice's triumphal car drawn by 4 horſes, 6 other cars with priſoners and ſpoils drawn by 12 horſes, 6 coaches. Among the ſcenes and repreſentations in the firſt act were a vaſt plain with two triumphal arches, another plain with pavilions and tents, and a foreſt for the chace: in the third, the royal dreſſing-room completely furniſhed, ſtables with 100 live horſes, portico adorned with tapeſtry, and a ſtupendous palace in perſpective. At the end of the firſt act were repreſentations of every kind of chace, wild boar, ſtag, deer, bears. At the end of the third act, an enormous globe, deſcended as from the ſky, divided itſelf into other globes ſuſpended in the air, and ornamented with emblematical figures of time, fame, honour, &c.

Early in the laſt century, machinery and decoration uſurped the importance due to poetry and muſic in ſuch exhibitions.

Few or no traces occur of muſical dramas at Naples till the beginning of the preſent century. Before the time of the elder Scarlatti, it ſeems as if Naples had been leſs fertile in great contrapuntiſts, and leſs diligent in the cultivation of dramatic muſic, than any other ſtate of Italy. Since that time all the reſt of

Europe has been furniſhed with compoſers and performers from that city.

42 French and Engliſh opera.

The word *opera* ſeems to have been familar to Engliſh poets from the beginning of the laſt century. *Stilo recitativo*, a recent innovation even in Italy, is mentioned by Ben Johnſon ſo early as 1617. From this time it was uſed in maſques, occaſionally in plays, and in cantatas before a regular drama wholly ſet to muſic was attempted. By the united abilities of Quinault and Lulli, the opera in France had ariſen to high favour. This circumſtance afforded eucouragement to ſeveral attempts at dramatic muſic in England by Sir William D'Avenant and others, before the muſic, language, or performers of Italy were employed on our ſtage. Pieces, ſtyled *dramatic operas*, preceded the Italian opera on the ſtage of England. Theſe were written in Engliſh, and exhibited with a profuſe decoration of ſcenery and habits, and with the beſt ſingers and dancers that could be procured: Pſyche and Circe, are entertainments of this kind: the Tempeſt and Macbeth were acted with the ſame accompaniments.

During the 17th century, whatever attempts were made in muſical drama, the language ſung was always Engliſh. About the end of that century, however, Italian ſinging began to be encouraged, and vocal as well as inſtrumental muſicians from that country began to appear in Britain.

The firſt muſical drama, performed wholly after the Italian manner in recitative for the dialogue or narrative parts, and meaſured melody for the airs, was Arſinoe queen of Cyprus, tranſlated from an Italian opera of the ſame name, written by Stanzani of Bologna. The Engliſh verſion of this opera was ſet to muſic by Thomas Clayton, one of the royal band, in the reign of William and Mary. The ſingers were all Engliſh, Meſſrs Hughes, Leveredge, and Cook; Mrs Tofts, Mrs Croſs, and Mrs Lyndſey. The tranſlation of Arſinoe, and the muſic to which it is ſet, are execrable; yet ſuch is the charm of novelty, that this miſerable performance, deſerving neither the name of a drama by its poetry, nor of an opera by its muſic, ſuſtained 24 repreſentations, and the ſecond year 11.

Operas, notwithſtanding their deficiences in poetry, muſic, and performance (no foreign compoſer or eminent ſinger having yet arrived), became ſo formidable to our actors at the theatres, that it appears from the Daily Courant, 14th January 1707, a ſubſcription was opened "for the encouragement of the comedians acting in the Haymarket, and to enable them to keep the diverſions of plays under a ſeparate intereſt from operas."

Mr Addiſon's opera of Roſamond appeared about this time; but the muſic ſet by Clatyon is ſo contemptible, that the merit of the poetry, however great, could not of itſelf long ſupport the piece. The choice of ſo mean a compoſer as Clayton, and Mr Addiſon's partiality to his abilities, betray a want of muſical taſte in that elegant author.

The firſt truly great ſinger who appeared on the ſtage of Britain was *Cavalier Nicolino Grimaldi*, commonly known by the name of *Nicolini*. He was a Neapolitan; and though a beautiful ſinger indeed, was ſtill more eminent as an actor. In the Tatler, n° 115. the elegance and propriety of his action are particularly deſcribed. Recently before his appearance, *Valentini Urbani* and a female ſinger called *The Barroneſs*, arrived. Margarita de l'Epine, who afterwards married Dr Pepuſch, had been in this country ſome time before.

The firſt opera performed *wholly in Italian*, and *by Italian ſingers*, was *Almahide*. As, at preſent, ſo at that time, operas were generally performed twice a-week.

43 Handel in England.

The year 1710 is diſtinguiſhed in the annals of muſic by the arrival in Britain of George Frederick Handel. Handel had been in the ſervice of the elector of Hanover, and came firſt to England on a viſit of curioſity. The fame of this great muſician had penetrated into this country before he himſelf arrived in it: and Aaron Hill, then in the direction of the Haymarket theatre, inſtantly applied to him to compoſe an opera. It was Rinaldo; the admirable muſic of which he produced entirely in a fortnight. Soon after this period appeared, for the firſt time as an opera ſinger, the celebrated Mrs Anaſtaſia Robinſon. Mrs Robinſon, who was the daughter of a portrait painter, made her firſt public exhibitions in the concerts at York-buildings; and acquired ſo much the public favour, that her father was encouraged to take a houſe in Golden Square, for the purpoſe of eſtabliſhing weekly concerts and aſſemblies, in the manner of C*onverſazioni*, which became the reſort of the moſt polite audiences.

Soon after Mrs Robinſon accepted of an engagement at the Opera, where her ſalary is ſaid to have been L. 1000, and her other emoluments equal to that ſum. She quitted the ſtage in conſequence of her marriage with the gallant earl of Peterborough, the friend of Pope and Swift. The eminent virtues and accompliſhments of this lady, who died a few years ago at the age of 88, entitled her to be mentioned even in a compend too ſhort for biography. The conducting of the opera having been found to be more expenſive than profitable, it was entirely ſuſpended from 1717 till 1720, when a fund of L. 50,000 for ſupporting and carrying it on was ſubſcribed by the firſt perſonages of the kingdom. The ſubſcribers, of whom king George I. was one, for L. 1000, were formed into a ſociety, and named *The Royal Academy of Muſic*. Handel was commiſſioned to engage the performers; for that purpoſe he went to Dreſden, were Italian operas were at that time performed in the moſt ſplendid manner at the court of Auguſtus elector of Saxony, then king of Poland. Here Handel engaged Seneſino-Berenſtadt, Boſchi, and the Duranſtanti.

44 Progreſs of the opera and its management.

In the year 1723, the celebrated Franceſca Cuzzoni appeared as a firſt-rate ſinger: and two years afterwards arrived her diſtinguiſhed rival Signora Fauſtina Bordoni.

In a cantabile air, though the notes Cuzzoni added were few, ſhe never loſt an opportunity of enriching the cantilena with the moſt beautiful embeliſhments. Her ſhake was perfect. She poſſeſſed a creative fancy; and ſhe enjoyed the power of occaſionally accelerating and retarding the meaſure in the moſt artificial and able manner, by what is in Italy called *tempo rubato*. Her high notes were unrivalled in clearneſs and ſweetneſs. Her intonations were ſo juſt and ſo fixed, that it ſeemed as if ſhe had not the power to ſing out of tune.

Fauſtina Bordoni, wife of the celebrated Saxon compoſer Haſſe, invented a new kind of ſinging, by running diviſions, with a neatneſs and velocity which aſtoniſhed all who heard her. By taking her breath imperceptibly, ſhe had the art of ſuſtaining a note apparently longer than any other ſinger. Her beats and trills were ſtrong and rapid; her intonation perfect. Her profeſſional perfections were enhanced by a beautiful face, fine ſymmetry of figure, and a countenance and geſture on the ſtage which indicated an entire intelligence and poſſeſſion of the ſeveral parts allotted to her.

Theſe two angelic performers excited ſo ſignally the attention of the public, that a party ſpirit between the abettors of the one and of the other was formed, as violent and as inveterate almoſt as any of thoſe that had ever occurred relative to matters either theological or political; yet ſo diſtinct were their ſtyles of ſinging, ſo different their talents, that the praiſe of the one was no reproach to the other.

In leſs than ſeven years, the whole L. 50,000 ſubſcribed by the Royal Academy, beſides the produce of admiſſion to non-ſubſcribers, was expended, and the governor and directors of the ſociety relinquiſhed the idea of continuing their engagements; conſequently, at the cloſe of the ſeaſon 1727, the whole band of ſingers diſperſed. The next year we find Seneſino, Fauſtina, Balde, Cuzzoni, Nicolini, Farinelli, and Boſche, at Venice.

Handel, however, at his own riſk, after a ſuſpenſion of about a twelvemonth, determined to recommence the Opera; and accordingly engaged a band of performers entirely new. Theſe were Signor Bernacchi, Signora Merighi, Signora Strada, Signor Anibale Pio Fabri, his wife, Signora Bertoldi, and, John Godfrid Reimſchnider.

45 Invention of the oratorio, and its introduction into England

The ſacred muſical drama, or oratorio, was invented early in the 14th century. Every nation in Europe ſeems firſt to have had recourſe to religious ſubjects for dramatic exhibitions. The oratorios had been common in Italy during the laſt century; they had never been *publicly* introduced in England till Handel, ſtimulated by the rivalſhip of other adventurers, exhibited in 1732 his oratorios of Eſther, and of Acis and Galatea, the laſt of which he had compoſed 12 years before for the duke of Chandos's chapel at Cannons. The moſt formidable oppoſition which Handel met with in his conduct of the Italian opera was a new theatre for exhibiting theſe operas, opened by ſubſcription in Lincoln's-inn Fields, under the conduct of Nicola Porpora, a reſpectable compoſer. A difference having occurred between Handel and Seneſino, Seneſino had for ſome time deſerted the Haymarket, where Handel managed, and was now engaged at the rival theatre of Lincoln's-inn Fields. To ſupply the place of Seneſino, Handel brought over *Giovanni Careſtini*, a ſinger of the moſt extenſive powers. His voice was at firſt a powerful and clear ſoprano; afterwards it changed into the fulleſt, fineſt, deepeſt, counter-tenor that has perhaps ever been heard. Careſtini's perſon was tall, beautiful, and majeſtic. He rendered every thing he ſung intereſting by energy, taſte, and judicious embelliſhment. In the execution of difficult diviſions from the cheſt, his manner was articulate and admirable. It was the opinion of Haſſe, as well as other eminent profeſſors, that whoever had not heard Careſtini, was unacquainted with the moſt perfect ſtyle of ſinging. The opera under the direction of Porpora was removed to the Haymarket, which Handel had left. Handel occupied the theatre of Lincoln's-inn Fields; but his rivals now acquired a vaſt advantage of attraction, by the acceſſion of Carlo Broſchi detto Farinelli to their party, who at this time arrived. This renowned ſinger ſeems to have tranſcended the limits of all anterior vocal excellence. No vocal performer of the preſent century has been ſo unanimouſly allowed to poſſeſs an uncommon power, ſweetneſs, extent, and agility of voice, as Farinelli. Niccolini, Seneſino, and Careſtini, gratified the eye as much by the dignity, grace, and propriety of their action and deportment, as the ear, by the judicious uſe of a few notes within the limits of a ſmall compaſs of voice; but Farinelli, without the aſſiſtance of ſignificant geſtures or graceful attitudes, enchanted and aſtoniſhed his hearers, by the force, extent, and mellifluous tones of the mere organ, when he had nothing to execute, articulate, or expreſs. Though during the time of ſinging he was as motionleſs as a ſtatue, his voice was ſo active that no intervals were too cloſe, too wide, or too rapid, for his execution.

Handel having loſt a great part of his fortune by the opera, was under the neceſſity of trying the public gratitude in a benefit, which was not diſgraced by the event: the theatre, for the honour of the nation, was ſo crowded, that he is ſaid to have cleared L. 800.

46 Opera in England given up.

After a fruitleſs attempt by Heidegger, the coadjutor of Handel in the conduct of the opera, and patentee of the King's Theatre in Haymarket, to procure a ſubſcription for continuing it, it was found neceſſary to give up the undertaking.

It was about this time that the ſtatue of Handel was erected in Vauxhall, at the expence of Mr Tyers, proprietor of thoſe gardens.

The next year (1739) Handel carried on oratorios at the Haymarket, as the opera there was ſuſpended. The earl of Middleſex now undertook the troubleſome office of *impreſario* of the Italian opera. He engaged the King's theatre, with a band of ſingers from the continent almoſt entirely new. Caluppi was his compoſer. Handel, almoſt ruined, retired at this time to Ireland, where he remained a conſiderable time. In 1744, he again attempted oratorios at the King's theatre, which was then, and till 1746, unoccupied by the opera, on account of the rebellion.

47 Revived.

The arrival of Giardini in London this year forms a memorable æra in the inſtrumental annals of England. His powers on the violin were unequalled. The ſame year Dr Croza, then manager of the opera, eloped, leaving the performers, and innumerable trades-people his creditors. This incident put an end to operas of all kinds for ſome time.

This year a comic opera, called *Il Filoſopho di Campagna*, compoſed by Caluppi, was exhibited, which ſurpaſſed in muſical merit all the comic operas performed in England till the *Bicona Figliula*. Signora Paganini acquired ſuch fame by the airs allotted to her in that piece, that the crowds at her benefit were beyond example. Caps were loſt, gowns torn in pieces, and ladies in full dreſs, without ſervants or carriages, were obliged to walk home, amidſt the merriment of the ſpectators on the ſtreets.

48 1764 and 1765. Manzoli. At this period the arrival of Giovanni Manzoli marked a ſplendid æra in the annals of muſical drama, by conferring on ſerious opera a degree of importance to which it had ſeldom yet ariſen ſince its eſtabliſhment in England. Manzoli's voice was the moſt powerful and voluminous ſoprano that had been heard ſince the time of Farinelli: his manner of ſinging was grand, and full of taſte and dignity.

49 Tenducci. At this time Tenducci, who had been in England ſome time before, and was now returned much improved, performed in the ſtation of ſecond man to Manzoli.

50 1769. Guadagni. Gaetano Guadagni made a great figure at this time. He had been in this country early in life (1748), as ſerious-man in a burletta troop of ſingers. His voice was then a full and well-toned counter-tenor; but he ſung wildly and careleſsly. The excellence of his voice, however, attracted the notice of Handel, who aſſigned him the parts in his oratorios the Meſſiah and Samſon, which had been originally compoſed for Mrs Cibber. He quitted London for the firſt time about 1753. The higheſt expectations of his abilities were raiſed by fame before his ſecond arrival, at the time of which we treat. As an actor he ſeems to have had no equal on any ſtage in Europe. His figure was uncommonly elegant and noble; his countenance replete with beauty, intelligence, and dignity; his attitudes were full of grace and propriety. Thoſe who remembered his voice when formerly in England were now diſappointed: it was comparatively thin and feeble; he had now changed it to a ſoprano, and extended its compaſs from ſix or ſeven notes to fourteen or fifteen. The muſic he ſung was the moſt ſimple imaginable; a few notes with frequent pauſes, and opportunities of being liberated from the compoſer and the band, were all he required. In theſe effuſions, ſeemingly extemporaneous, he diſplayed the native power of melody unaided by harmony or even by uniſonous accompaniment: the pleaſure he communicated proceeded principally from his artful manner of diminiſhing the tones of his voice, like the dying notes of the Æolian harp. Moſt other ſingers affect a ſwell, or *meſſa de voce;* but Guadagni, after beginning a note with force, attenuated it ſo delicately that it poſſeſſed all the effect of extreme diſtance. During the ſeaſon 1770 and 1771, Tenducci was the immediate ſucceſſor of Guadagni. This performer, who appeared in England firſt only as a ſinger of the ſecond or third claſs, was during his reſidence in Scotland and Ireland ſo much improved as to be well received as firſt man, not only on the ſtage of London but in all the great theatres of Italy.

It was during this period that dancing ſeemed firſt to gain the aſcendant over muſic by the ſuperior talents of Mademoiſelle Heinel, whoſe grace and execution were ſo perfect as to eclipſe all other excellence.

51 1774. Miſs Davies. In the firſt opera performed this ſeaſon (*Lucio Vero*) appeared Miſs Cecilia Davies, known in Italy by the name of L'Ingleſina. Miſs Davies had the honour of being the firſt Engliſh woman who had ever been thought worthy of ſinging on any ſtage in Italy. She even performed with eclat the principal female characters on many of the great theatres of that country. Gabrielli only on the Continent was ſaid to ſurpaſs her. Her voice, though not of great volume, was clear and perfectly in tune; her ſhake was open and diſtinct, without the ſluggiſhneſs of the French cadence. The flexibility of her throat rendered her execution equal to the moſt rapid diviſions.

Next ſeaſon introduced Venanzio Ravygini, a beautiful and animated young man; a compoſer as well as a ſinger.—His voice was ſweet, clear, flexible; in compaſs more than two octaves.

52 Caterina Gabrielli. The ſeaſon 1775 and 1776 was rendered memorable by the arrival of the celebrated *Caterina Gabrielli*, ſtyled early in life *La Couchetina*, being the daughter of a cardinals cook at Rome. She had, however, in her countenance and deportment no indications of low birth. Her manner and appearance depicted dignity and grace. So great was her reputation before her arrival in England for ſinging and for caprice, that the public expecting perhaps in both too much, were unwilling to allow her due praiſe for her performance, and were apt to aſcribe every thing ſhe did to pride and inſolence. Her voice, though exquiſite, was not very powerful. Her chief excellence having been the neatneſs and rapidity of her execution, the ſurpriſe of the public muſt have been much diminiſhed on hearing her after Miſs Davies, who ſung many of the ſame ſongs in the ſame ſtyle, and with a neatneſs ſo nearly equal, that common hearers could diſtinguiſh no difference. The diſcriminating critic, however, might have diſcovered a ſuperior ſweetneſs in the natural tone of the Gabrielli's voice, an elegance in the finiſhing of her muſical periods or paſſages, an accent and preciſion in her diviſions, ſuperior not only to Miſs Davies, but to every other ſinger of her time. In ſlow movements her pathetic powers, like thoſe in general of performers moſt renowned for agility, were not exquiſitely touching. She now reſides at Bologna.

53 Agujari at the Pantheon. About the time of which we have been treating, the proprietors of the Pantheon ventured to engage the *Agujari* at the enormous ſalary of L. 100 *per* night, for ſinging two ſongs only! *Lucrezia Agujari* was a truly wonderful performer. The lower part of her voice was full, round, and of excellent quality; its compaſs amazing. She had two octaves of fair natural voice, from A on the fifth line in the baſs to A on the ſixth line in the treble, and beyond that in *alt* ſhe had in early youth more than another octave. She has been heard to aſcend to B b *in altiſſimo*. Her ſhake was open and perfect; her intonation true: her execution marked and rapid; the ſtyle of her ſinging, in the natural compaſs of her voice, grand and majeſtic.

54 Anna Pozzi. In 1776 arrived Anna Pozzi, as ſucceſſor to the Gabrielli. She poſſeſſed a voice clear, ſweet, and powerful; but her inexperience, both as an actreſs and as a ſinger, produced a contraſt very unfavourable to her when compared with ſo celebrated a performer as Gabrielli. Since that time, however, Pozzi, with more ſtudy and knowledge, has become one of the beſt and moſt admired female ſingers in Italy.

55 Georgi. After the departure of Agujari for the ſecond and laſt time, the managers of the Pantheon engaged the *Georgi* as her ſucceſſor. Her voice was exquiſitely fine,

but totally uncultivated. She is now employed as the firſt woman in the operas of the principal cities of Italy.

56 Roncaglia and Danze.

During the ſeaſons 1777 and 1778, the principal ſingers at the opera in London were Frandeſco Roncaglia and Franceſca Danze, afterwards Madame Le Brun.

Roncaglia poſſeſſed a ſweet-toned voice; but of the three great requiſites of a complete ſtage-ſinger, pathos, grace, and execution, which the Italians call *cantabile*, *grazioſa*, and *bravura*, he could lay claim only to the ſecond. His voice, a *voce de camera*, when confined to the *grazioſa* in a room, leaves nothing to wiſh for.

Danze had a voice well in tune, a good ſhake, great execution, prodigious compaſs, with great knowledge of muſic; yet the pleaſure her performance imparted was not equal to theſe accompliſhments: but her object was not ſo much pathos and grace, as to ſurpriſe by the imitation of the tone and difficulties of inſtruments.

57 Pacchierotti.

This year *Gaſparo Pacchierotti* appeared in London, whither his high reputation had penetrated long before. The natural tone of his voice is intereſting, ſweet, and pathetic. His compaſs downwards is great, with an aſcent up to B b, and ſometimes to C *in alt*. He poſſeſſes an unbounded fancy, and the power not only of executing the moſt difficult and refined paſſages, but of inventing embelliſhment entirely new. *Ferdinando Bertoni*, a well-known compoſer, came along with Pacchierotti to Britain.

58 Dancing gains the aſcendant over muſic at the opera houſe.

During the laſt ten years, dancing has become an important branch of the amuſements of the opera-houſe. Mademoiſelle Heinel, M. Veſtris le Jeune, Mademoiſelle Baccelli, had, during ſome years, delighted the audience at the opera; but on the arrival of M. Veſtris l'Aine, pleaſure was exchanged for ecſtaſy. In the year 1781, Pacchierotti had by this time been ſo frequently heard that his ſinging was no impediment to converſation; but while the elder Veſtris was on the ſtage, not a breathing was to be heard. Thoſe lovers of muſic who talked the loudeſt while Pachierotti ſung, were in agonies of terror leſt the graceful movements of Veſtris, *le dieu de la danſe*, ſhould be diſturbed by audible approbation. Since that time, the moſt mute and reſpectful attention has been paid to the manly grace of Le Picq, and the light fantaſtic toe of the younger Veſtris; to the Roſſis, the Theodores, the Coulons, the Hillingſburgs; while the ſlighted ſingers have been diſturbed, not by the violence of applauſe, but the clamour of inattention.

59 Commemoration of Handel in Weſtminſter Abbey.

The year 1784 was rendered a memorable era in the annals of muſic by the ſplendid and magnificent manner in which the birth and genius of Handel were celebrated in Weſtminſter Abbey and the Pantheon, by five performances of pieces ſelected from his own works, and executed by a band of more than 500 voices and inſtruments, in the preſence and under the immediate auſpices of their majeſties and the firſt perſonages of the kingdom. The commemoration of Handel has been ſince eſtabliſhed as an annual muſical feſtival for charitable purpoſes; in which the number of performers and the perfection of the performances have continued to increaſe. In 1785 the band, vocal and inſtrumental, amounted to 616; in 1786 to 741; in 1787 to 806.

Dr Burney publiſhed An Account of the Muſical Performances in Commemoration of Handel, for the benefit of the Muſical Fund. The members and guardians of that fund are now incorporated under the title of *Royal Society of Muſicians*. See HANDEL.

This year Pacchierotti and his friend Bertoni left England. About the ſame time our country was deprived of the eminent compoſer Sacchini, and Giardini the greateſt performer on the violin then in Europe.

60 Excellence of Madam Mara.

As a compenſation for theſe loſſes, this memorable year is diſtinguiſhed by the arrival of Madam Mara, whoſe performance in the commemoration of Handel in Weſtminſter Abbey inſpired an audience of 3000 of the firſt people of the kingdom, not only with pleaſure but with ecſtaſy and rapture.

61 Rubinelli.

In 1786 arrived *Giovanni Rubinelli*. His voice is a true and full contralto from C in the middle of the ſcale to the octave above. His ſtyle is grand; his execution neat and diſtinct; his taſte and embelliſhments new, ſelect, and maſterly.

62 A new dance by M. Noverre.

In 1788 a new dance, compoſed by the celebrated M. Noverre, called *Cupid and Pſyche*, was exhibited along with the opera *La Locandiera*, which produced an effect ſo uncommon as to deſerve notice. So great was the pleaſure it afforded to the ſpectators, that Noverre was unanimouſly brought on the ſtage and crowned with laurel by the principal performers. This, though common in France, was a new mark of approbation in England.

63 Marcheſi.

This year arrived Signor Luige Marcheſi, a ſinger whoſe talents have been the ſubject of praiſe and admiration on every great theatre of Europe. Marcheſi's ſtyle of ſinging is not only elegant and refined in an uncommon degree, but often grand and full of dignity, particularly in his recitative and occaſional low notes. His variety of embelliſhment and facility of running extempore diviſions are wonderful. Many of his graces are elegant and of his own invention.

64 Diſcriminated characters of Pacchierotti, Rubinelli, and Marcheſi.

The three greateſt Italian ſingers of the preſent times are certainly Pacchierotti, Rubinelli, and Marcheſi. In diſcriminating the ſeveral excellencies of theſe great performers, a very reſpectable judge, Dr Burney, has particularly praiſed the ſweet and touching voice of Pacchierotti; his fine ſhake, his exquiſite taſte, his great fancy, and his divine expreſſion in pathetic ſongs: Of Rubinelli's voice, the fulneſs, ſteadineſs, and majeſty, the accuracy of his intonations, his judicious graces: Of Marcheſi's voice, the elegance and flexibility, his grandeur in recitative, and his boundleſs fancy and embelliſhments.—Having mentioned Dr Burney, we are in juſtice bound to acknowledge the aid we have derived from his hiſtory; a work which we greatly prefer to every other modern production on the ſubject. During the latter part of the preſent century many eminent compoſers have flouriſhed on the continent; ſuch as Jomelli, the family of the Bachs, Gluck, Haydn, and many others, whoſe different ſtyles and excellencies would well deſerve to be particulariſed, would our limits permit.

65 Sovereign princes dilettanti.

With the ſame regard to brevity, we can do no more than juſt mention the late king of Pruſſia, the late elector of Bavaria, and prince Lobkowitz, as eminent dilettanti of modern times.

Beſides the opera-ſingers whom we have mentioned, 66 Singers on theatres and in public gardens.

our theatres and public gardens have exhibited ſingers of conſiderable merit. In 1730, Miſs Raſter, afterwards the celebrated Mrs Clive, firſt appeared on the ſtage at Drury-lane as a ſinger. The ſame year introduced Miſs Cecilia Young, afterward the wife of Dr Arne. Her ſtyle of ſinging was infinitely ſuperior to that of any other Engliſh woman of her time.

67 Favourite muſicians.

Our favourite muſicians at this time were, Dubourg, Clegg, Clarke, and Feſting, on the violin; Kytch on the hautboy; Jack Feſting on the German flute; Baſton on the common flute; Karba on the baſſoon; Valentine Snow on the trumpet; and on the organ, Roſeingrave, Green, Robinſon, Magnus, Jack James, and the blind Stanley, who ſeems to have been preferred. The favourite playhouſe ſinger was Salway; and at concerts Mountier of Chicheſter.

As compoſers for our national theatre, Pepuſch and Galliard ſeem to have been unrivalled till 1732; when two competitors appeared, who were long in poſſeſſion of the public favour: We allude to John Frederick Lampe and Thomas Auguſtus Arne.

In 1736 Mrs Cibber, who had captivated every hearer of ſenſibility by her native ſweetneſs of voice and powers of expreſſion as a ſinger, made her firſt attempt as a tragic actreſs. The ſame year Beard became a favourite ſinger at Covent-garden. At this time Miſs Young, afterwards Mrs Arne, and her two ſiſters Iſabella and Eſther, were the favourite Engliſh female ſingers.

68 Fund for decayed muſicians.

In 1738 was inſtituted the fund for the ſupport of decayed muſicians and their families.

It was in 1745 that Mr Tyers, proprietor of Vauxhall gardens, firſt added vocal muſic to the other entertainments of that place. A ſhort time before Ranelagh had become a place of public amuſement.

69 Arrival of Giardini.

In 1749 arrived Giardini, whoſe great taſte, hand, and ſtyle in playing on the violin, procured him univerſal admiration. A few years after his arrival he formed a morning *academia* or concert at his houſe, compoſed chiefly of his ſcholars.

About this time San Martini and Charles Aviſon were eminent compoſers.

70 Style of Arne.

Of near 150 muſical pieces brought on our national theatres within theſe 40 years, 30 of them at leaſt were ſet by Arne. The ſtyle of this compoſer, if analyſed, would perhaps appear to be neither Italian nor Engliſh; but an agreeable mixture of both and of Scotch.

71 The earl of Kelly.

The late earl of Kelly, who died but a few years ago, deſerves particular notice, as poſſeſſed of a very eminent degree of muſical ſcience, far ſuperior to other dilettanti, and perhaps not inferior to any profeſſor of his time. There was no part of theoretical or practical muſic in which he was not thoroughly verſed: He poſſeſſed a ſtrength of hand on the violin, and a genius for compoſition, with which few profeſſors are giſted.

72 Abel.

Charles Frederic Abel was an admirable muſician: his performance on the viol da gamba was in every particular complete and perfect. He had a hand which no difficulties could embarraſs; a taſte the moſt refined and delicate; a judgment ſo correct and certain as never to permit a ſingle note to eſcape him without meaning. His compoſitions were eaſy and elegantly ſimple. In writing and playing an adagio he was ſuperior to all praiſe: the moſt pleaſing yet learned modulation, the richeſt harmony, the moſt elegant and poliſhed melody, were all expreſſed with the moſt exquiſite feeling, taſte, and ſcience. His manner of playing an adagio ſoon became the model of imitation for all our young performers on bowed inſtruments. Bartholemon, Cervetto, Cramer, and Croſdil, may in this reſpect be ranked as of his ſchool. All lovers of muſic muſt have lamented that Abel in youth had not attached himſelf to an inſtrument more worthy of his genius, taſte, and learning, than the viol de gamba, that remnant of the old cheſt of viols which during the laſt century was a neceſſary appendage of a nobleman's or gentleman's family throughout Europe, previous to the admiſſion of violins, tenors, and baſes, in private houſes or public concerts. Since the death of the late elector of Bavaria, who was next to Abel (the beſt performer on the viol de gamba in Europe), the inſtrument ſeems quite laid aſide. It was uſed longer in Germany than elſewhere; but the place of gambiſt ſeems now as much ſuppreſſed in the chapels of German princes as that of lutaniſts. The celebrated performer on the violin, Lolle, came to England in 1785. Such was his caprice, that he was ſeldom heard; and ſo eccentric was his ſtyle and compoſition, that by many he was regarded as a madman. He was, however, during his lucid intervals a very great and expreſſive performer in the ſerious ſtyle.

73 Mrs Billington.

Mrs Billington, after diſtinguiſhing herſelf in childhood as a neat and expreſſive performer on the piano-forte, appeared all at once in 1786 as a ſweet and captivating ſinger. In emulation of the Mara and other great bravura ſingers, ſhe at firſt too frequently attempted paſſages of difficulty; now, however, ſo greatly has ſhe improved, that no ſong ſeems too high or too rapid for her execution. The natural tone of her voice is ſo exquiſitely ſweet, her knowledge of muſic ſo conſiderable, her ſhake ſo true, her cloſes and embelliſhments ſo various, her expreſſions ſo grateful, that envy only or apathy could hear her without delight. The preſent compoſers, and performers of the firſt claſs, are ſo well known to the lovers of the art, that it would be needleſs and improper to mention them particularly; and to deſcribe the diſtinctive powers of Bartholemon, Cramer, Pieltain, Raimonde, and Salamon, would be too delicate a taſk for us to undertake.

[73] The Catch-club and the concert of ancient muſic.

The Catch-club at the Thatched Houſe, inſtituted in 1762 by the late earl of Eglinton, the preſent duke of Queenſberry, and others; and the concert of ancient muſic, ſuggeſted by the earl of Sandwich in 1776, have had a beneficial effect in improving the art.

We have been ſomewhat particular in our account of muſical affairs in our own country during the preſent century, as what would be moſt intereſting to general readers, and of which a well-informed gentleman would not wiſh to be ignorant. The profeſſor and connoiſſeur is not to be expected to content himſelf with diſquiſitions much more minute than thoſe of which our limits can be ſuppoſed to admit.

ELEMENTS OF MUSIC.

Theoretical and Practical (†).

PRELIMINARY DISCOURSE.

74 Muſic conſidered in a double view. MUSIC may be conſidered, either as an art, which has for its object one of the greateſt pleaſures of which our ſenſes (‡) are ſuſceptible; or as a ſcience, by which that art is reduced to principles. This is the double view in which we mean to treat of muſic in this work.

75 Progreſs of muſic like that of other arts and ſciences. It has been the caſe with muſic as with all the other arts invented by men: ſome facts were at firſt diſcovered by accident; ſoon afterwards reflection and obſervation inveſtigated others; and from theſe facts, properly diſpoſed and united, philoſophers were not ſlow in forming a body of ſcience, which afterwards increaſed by degrees.

The firſt theories of muſic were perhaps as ancient as the earlieſt age which we know to have been diſtinguiſhed by philoſophy, even as the age of Pythagoras; nor does hiſtory leave us any room to doubt, that from the period when that philoſopher taught, the ancients cultivated muſic, both as an art and as a ſcience, with great aſſiduity. But there remains to us much uncertainty concerning the degree of perfection to which they brought it. Almoſt every queſtion which has been propoſed with reſpect to the muſic of the ancients has divided the learned; and may probably ſtill continue to divide them, for want of monuments ſufficient in their number, and inconteſtable in their nature, from whence we might be enabled to exhibit teſtimonies and diſcoveries inſtead of ſuppoſitions and conjectures. In the preceding hiſtory we have ſtated a few facts reſpecting the nature of ancient muſic, and the inventors of the ſeveral muſical inſtruments; but it were to be wiſhed, that, in order to elucidate, as much as poſſible, a point ſo momentous in the hiſtory of the ſciences, ſome perſon of learning, equally ſkilled in the Greek language and in muſic, ſhould exert himſelf to unite and diſcuſs in the ſame work the moſt probable opinions eſtabliſhed or propoſed by the learned upon a ſubject ſo difficult and curious. This philoſophical hiſtory of ancient muſic is a work which might highly embelliſh the literature of our times.

76 The hiſtory of muſic a deſideratum in literature.

In the mean time, till an author can be found ſufficiently inſtructed in the arts and in hiſtory to undertake ſuch a labour with ſucceſs, we ſhall content ourſelves with conſidering the preſent ſtate of muſic, and limit our endeavours to the explication of thoſe acceſſions which have accrued to the theory of muſic in theſe latter times.

There are two departments in muſic, melody * and harmony †. Melody is the art of arranging ſeveral ſounds in ſucceſſion one to another in a manner agreeable to the ear; harmony is the art of pleaſing that organ by the union of ſeveral ſounds which are heard at one and the ſame time. Melody has been known and felt through all ages: perhaps the ſame cannot be affirmed of harmony (§); we know not whether the ancients made any uſe of it or not, nor at what period it began to be practiſed.

* See Melody. † See Harmony.

Not but that the ancients certainly employed in their muſic

(†) To deliver the elementary principles of muſic theoretical and practical, in a manner which may prove at once entertaining and inſtructive, without protracting this article much beyond the limits preſcribed in our plan, appears to us no eaſy taſk. We therefore heſitated for ſome time, whether to try our own ſtrength, or to follow ſome eminent author on the ſame ſubject. Of theſe the laſt ſeemed preferable. Amongſt theſe authors, none appeared to us to have written any thing ſo fit for our purpoſe as M. D'Alembert, whoſe treatiſe on muſic is the moſt methodical, perſpicuous, conciſe, and elegant diſſertation on that ſubject with which we are acquainted. As it was unknown to moſt Engliſh readers before the former edition of this work, it ought to have all the merit of an original. We have given a faithful tranſlation of it; but in the notes, ſeveral remarks are added, and many authors quoted, which will not be found in the original. It is a work ſo ſyſtematically compoſed, that all attempts to abridge it, without rendering it obſcure and imperfect, would be impracticable. It is perhaps impoſſible to render the ſyſtem of muſic intelligible in a work of leſs compaſs than that with which our readers are now preſented; and, in our judgment, a performance of this kind, which is written in ſuch a manner as not to be generally underſtood, were much better ſuppreſſed.

(‡) In this paſſage, and in the definitions of melody and harmony, our author ſeems to have adopted the vulgar error, that the pleaſures of muſic terminates in corporeal ſenſe. He would have pronounced it abſurd to aſſert the ſame thing of painting. Yet if the former be no more than a mere pleaſure of corporeal ſenſe, the latter muſt likewiſe be ranked in the ſame predicament. We acknowledge that corporeal ſenſe is the vehicle of ſound; but it is plain from our immediate feelings, that the reſults of ſound arranged according to the principles of melody, or combined and diſpoſed according to the laws of harmony, are the objects of a reflex or internal ſenſe.

For a more ſatisfactory diſcuſſion of this matter, the reader may conſult that elegant and judicious treatiſe on Muſical Expreſſion by Mr Aviſon. In the mean time it may be neceſſary to add, that in order to ſhun the appearance of affectation, we ſhall uſe the ordinary terms by which muſical ſenſations, or the mediums by which they are conveyed, are generally denominated.

(§) Though no certainty can be obtained what the ancients underſtood of harmony, nor in what manner and in what period they practiſed it; yet it is not without probability, that, both in ſpeculation and practice, they muſic thoſe chords which were moſt perfect and ſimple; ſuch as the octave, the fifth, and the third; but it ſeems doubtful whether they knew any of the other conſonances or not, or even whether in practice they could deduce the ſame advantages from the ſimple chords which were known to them, that have afterwards accrued from experience and combinations.

If that harmony which we now practiſe owes its origin to the experience and reflection of the moderns, there is the higheſt probability that the firſt eſſays of this art, as of all the others, were feeble, and the progreſs of its efforts almoſt imperceptible; and that, in the courſe of time, improving by ſmall gradations, the ſucceſſive labours of ſeveral geniuſes have elevated it to that degree of perfection in which at preſent we find it.

77
The origin of arts often accidental, and their progreſs gradual.

The firſt inventor of harmony eſcapes our inveſtigation, from the ſame cauſes which leave us ignorant of thoſe who firſt invented each particular ſcience; becauſe the original inventors could only advance one ſtep, a ſucceeding diſcoverer afterwards made a more ſenſible improvement, and the firſt imperfect eſſays in every kind were loſt in the more extenſive and ſtriking views to which they led. Thus the arts which we now enjoy, are for the moſt part far from being due to any particular man, or to any nation excluſively: they are produced by the united and ſucceſſive endeavours of mankind; they are the reſults of ſuch continued and united reflections, as have been formed by all men at all periods and in all nations.

It might, however, be wiſhed, that after having aſcertained, with as much accuracy as poſſible, the ſtate of ancient muſic by the ſmall number of Greek authors which remain to us, the ſame application were immediately directed to inveſtigate the firſt inconteſtable traces of harmony which appear in the ſucceeding ages, and to purſue thoſe traces from period to period. The products of theſe reſearches would doubtleſs be very imperfect, becauſe the books and monuments of the middle ages are by far too few to enlighten that gloomy and barbarous era; yet theſe diſcoveries would ſtill be precious to a philoſopher, who delights to obſerve the human mind in the gradual evolutions of its powers, and the progreſs of its attainments.

78
Delineations of the laws of harmony recent and imperfect.

The firſt compoſitions upon the laws of harmony which we know, are of no higher antiquity than two ages prior to our own; and they were followed by many others. But none of theſe eſſays was capable of ſatisfying the mind concerning the principles of harmony: they confined themſelves almoſt entirely to the ſingle occupation of collecting rules, without endeavouring to account for them; neither had their analogies one with another, nor their common ſource, been perceived; a blind and unenlightened experience was the only compaſs by which the artiſt could direct and regulate his courſe.

79
Its precepts not deduced from any principle till by M. Rameau.

M. Rameau was the firſt who began to tranſfuſe light and order through this chaos. In the different tones procured by the ſame ſonorous body, he found the moſt probable origin of harmony, and the cauſe of that pleaſure which we receive from it. His principle he unfolded, and ſhowed how the different phenomena of muſic were produced by it: he reduced all the conſonances to a ſmall number of ſimple and fundamental chords, of which the others are only combinations or various arrangements. He has, in ſhort, been able to diſcover, and render ſenſible to others, the mutual dependence between melody and harmony.

80
The author's motives for writing theſe elements.

Though theſe different topics may be contained in the writings of this celebrated artiſt, and in theſe writings may be underſtood by philoſophers who are likewiſe adepts in the art of muſic; ſtill, however, ſuch muſicians as were not philoſophers, and ſuch philoſophers as were not muſicians, have long deſired to ſee theſe objects brought more within the reach of their capacity: ſuch is the intention of the treatiſe I now preſent to the public. I had formerly compoſed it for the uſe of ſome friends. As the work appeared to them clear and methodical, they have engaged me to publiſh it, perſuaded (though perhaps with too much credulity) that it might be uſeful to facilitate the progreſs of initiates in the ſtudy of harmony.

This was the only motive which could have determined me to publiſh a book of which I might without heſitation aſſume the honour, if its materials had been the fruits of my own invention, but in which I can now boaſt no other merit than that of having developed, elucidated, and perhaps in ſome reſpects improved, the ideas of another (c).

81
Improvements of this edition.

The firſt edition of this eſſay, publiſhed 1752, having been favourably received by the world, and copies no longer to be found in the hands of bookſellers, I have endeavoured to render this more perfect.

82
Account of the work in general.

The detail which I mean to give of my labour, will preſent the reader with a general idea of the principle of M. Rameau, of the conſequences deduced from it, of the manner in which I have diſpoſed this principle and its conſequences; in ſhort, of what is ſtill a-wanting, and might be advantageous to the theory of this amiable art; of what ſtill remains for the learned to contribute towards the perfection of this theory; of the rocks and quickſands which they ought to avoid in this reſearch, and which could ſerve no other purpoſe than to retard their progreſs.

83
Rameau's origin of harmony.

Every ſonorous body, beſides its principal ſound, likewiſe exhibits to the ear the 12th and 17th major of that ſound. This multiplicity of different yet concordant ſounds, known for a conſiderable time, conſtitutes

tutes

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they were in poſſeſſion of what we denominate *counterpoint*. Without ſuppoſing this, there are ſome paſſages in the Greek authors which can admit of no ſatiſfactory interpretation. See the *Origin and Progreſs of Language*, Vol. II. Beſides, we can diſcover ſome veſtiges of harmony, however rude and imperfect, in the hiſtory of the Gothic ages, and amongſt the moſt barbarous people. This they could not have derived from more cultivated countries, becauſe it appears to be incorporated with their national muſic. The moſt rational account, therefore, which can be given, ſeems to be, that it was conveyed in a mechanical or traditionary manner through the Roman provinces from a more remote period of antiquity.

(c) See M. Rameau's letter upon this ſubject, *Merc. de Mai* 1752.

tutes the baſis of the whole theory of M. Rameau, and the foundation upon which he builds the whole ſuperſtructure of a muſical ſyſtem*. In theſe our *elements* may be ſeen, how from this experiment one may deduce, by an eaſy operation of reaſon, the chief points of melody and harmony; the perfect† chord, as well major as minor; the two‡ tetrachords employed in ancient muſic; the formation of our diatonic|| ſcale; the different values§ which the ſame ſound may have in that ſcale, according to the turn which is given to the baſs*; the alterations¶ which we obſerve in that ſcale, and the reaſon why they are totally imperceptible to the ear; the rules peculiar to the mode† major; the difficulty in‡ intonation of forming three tones|| in ſucceſſion; the reaſon why two perfect chords are proſcribed in immediate ſucceſſion in the diatonic order; the origin of the minor mode, its ſubordination to the mode major, and its variations; the uſe of diſcord§; the cauſes of ſuch effects as are produced by different kinds of muſic, whether diatonic, chromatic*, or enharmonic†; the principles and laws of temperament‡. In this diſcourſe we can only point out thoſe different objects, the ſubſequent eſſay being deſigned to explain them with the minuteneſs and preciſion which they require.

* See Syſtem.
† See Chord.
‡ See Tetrachord.
|| See Diatonic.
§ See Value.
* See Baſs.
¶ See Alteration.
† See Mode.
‡ See Intonation.
|| See Tone.
§ See Diſcord.
* See Chromatic.
† See Enharmonic.
‡ See Temperament.

One end which we have propoſed in this treatiſe, was not only to place the diſcoveries of M. Rameau in their moſt conſpicuous and advantageous light, but even in particular reſpects to render them more ſimple.—For inſtance, beſides the fundamental experiment which we have mentioned above, that celebrated muſician, to render the explication of ſome particular phenomena in muſic more acceſſible, had recourſe to another experiment; I mean that which ſhows that a ſonorous body ſtruck and put in vibration, forces its 12th and 17th major in deſcending to divide themſelves and produce a tremulous ſound. The chief uſe which M. Rameau made of this ſecond experiment was to inveſtigate the origin of the minor mode, and to give a ſatisfactory account of ſome other rules eſtabliſhed in harmony; and with reſpect to this in our firſt edition we have implicitly followed him: in this we have found means to deduce from the firſt experiment alone the formation of the minor mode, and beſides to diſengage that formation from all the queſtions which were foreign to it.

It is the ſame caſe with ſome other points (as the origin of the chord of the ſub dominant§, and the explication of the ſeventh in ſome peculiar reſpects), upon which it is imagined that we have ſimplified, and perhaps in ſome meaſure extended, the principles of the celebrated artiſt.

§ See Subdominant.

We have likewiſe baniſhed from this edition, as from the former, every conſideration of geometrical, arithmetical, and harmonical proportions and progreſſions, which authors have endeavoured to find in the mixture and protraction of tones produced by a ſonorous body; perſuaded as we are, that M. Rameau was under no neceſſity of paying the leaſt regard to theſe proportions, which we believe to be not only uſeleſs, but even, if we may venture to ſay ſo, fallacious when applied to the theory of muſic. In ſhort, though the relations produced by the octave, the fifth, and the third, &c. were quite different from what they are; though in theſe chords we ſhould neither remark any progreſſion nor any law; though they ſhou'd be incommenſurab'e one with another; the protracted tone of a ſonorous body, and the multiplied ſounds which reſult from it, are a ſufficient foundation for the whole harmonic ſyſtem.

84
Theoretical muſicians cautioned with regard to the admiſſion of mathematical or metaphyſical principles in muſic.

But though this work is intended to explain the theory of muſic, and to reduce it to a ſyſtem more complete and more luminous than has hitherto been done, we ought to caution thoſe who ſhall read this treatiſe, that they may be careful not to deceive themſelves, either by miſapprehending the nature of our object, or the end which our endeavours purſue.

We muſt not here look for that ſtriking evidence which is peculiar to geometrical diſcoveries alone, and which can be ſo rarely obtained in theſe mixed diſquiſitions, where natural philoſophy is likewiſe concerned: into the theory of muſical phenomena there muſt always enter a particular kind of metaphyſics, which theſe phenomena implicitly take for granted, and which brings along with it its natural obſcurity. In this ſubject, therefore, it would be abſurd to expect what is called *demonſtration*: it is an atchievement of no ſmall importance, to have reduced the principal facts to a ſyſtem conſiſtent with itſelf, and firmly connected in its parts; to have deduced them from one ſimple experiment; and to have eſtabliſhed upon this foundation the moſt common and eſſential rules of the muſical art. But in another view, if here it be improper to require that intimate and unalterable conviction which can only be produced by the ſtrongeſt evidence, we remain in the mean time doubtful whether it is poſſible to elucidate this ſubject more ſtrongly.

After this declaration, one ſhould not be aſtoniſhed, that, amongſt the facts which are deduced from our fundamental experiment, there ſhould be ſome which appear immediately to depend upon that experiment, and others which are deduced from it in a way more remote and leſs direct. In diſquiſitions of natural philoſophy, where we are ſcarcely allowed to uſe any other arguments, except ſuch as ariſe from analogy or congruity, it is natural that the analogy ſhould be ſometimes more ſometimes leſs ſenſible: and we will venture to aſſert, that ſuch a mind muſt be very improper for philoſophy, which cannot recogniſe and diſtinguiſh this gradation and the different circumſtances on which it proceeds. It is not even ſurpriſing, that in a ſubject where analogy alone can take place, this conductreſs ſhould deſert us all at once in our attempts to account for certain phenomena. This likewiſe happens in the ſubject which we now treat; nor do we conceal the fact, however mortifying, that there are certain points (though their number be but ſmall) which appear ſtill in ſome degree unaccountable from our principle. Such, for inſtance, is the procedure of the diatonic ſcale in deſcending; the formation of the chord commonly termed the *fifth redundant** or *ſuperfluous*, and ſome other facts of leſs importance, for which as yet we can ſcarcely offer any ſatisfactory account except from experience alone.

* See Redundant.

Thus, though the greateſt number of the phenomena in the art of muſic appear to be deducible in a ſimple and eaſy manner from the protracted tone of ſonorous bodies, one ought not perhaps with too much temerity to affirm as yet, that this mixed and protracted tone is *demonſtratively* the only original principle of harmony (D). But in the mean time it would not be leſs unjuſt to reject this principle, becauſe certain phenomena appear to be deduced from it with leſs ſucceſs than others. It is only neceſſary to conclude from this, either that by future ſcrutinies means may be found for reducing theſe phenomena to this principle; or that harmony has perhaps ſome other unknown principle, more general than that which reſults from the protracted and compounded tone of ſonorous bodies, and of which this is only a branch; or, laſtly, that we ought not perhaps to attempt the reduction of the whole ſcience of muſic to one and the ſame principle; which, however, is the natural effect of an impatience ſo frequent even among philoſophers themſelves, which induces them to take a part for the whole, and to judge of objects in their full extent by the greateſt number of their appearances.

85 Rameau's primary experiment has not as yet accounted for the phenomena of muſic. Perhaps ſome other may be neceſſary.

In thoſe ſciences which were called *phyſico-mathematical* (and amongſt this number perhaps the ſcience of ſounds may be placed), there are ſome phenomena which depend only upon one ſingle principle and one ſingle experiment: there are others which neceſſarily ſuppoſe a greater number both of experiments and principles, whoſe combination is indiſpenſable in forming an exact and complete ſyſtem; and muſic perhaps is in this laſt caſe. It is for this reaſon, that, whilſt we beſtow on M. Rameau all due praiſe, we ſhould not at the ſame time neglect to ſtimulate the learned in their endeavours to carry them ſtill to higher degrees of perfection, by adding, if it is poſſible, ſuch improvements as may be wanting to conſummate the ſcience.

Whatever the reſult of their efforts may be, the reputation of this intelligent artiſt has nothing to fear: he will ſtill have the advantage of being the firſt who rendered muſic a ſcience worthy of philoſophical attention; to have made its practice more ſimple and eaſy; and to have taught muſicians to employ in this ſubject the light of reaſon and analogy.

We would the more willingly perſuade thoſe who are ſkilled in theory and eminent in practice to extend and improve the views of him who before them purſued and pointed out the career, becauſe many amongſt them have already made laudable attempts, and have even been in ſome meaſure ſucceſsful in diffuſing new light through the theory of this enchanting art. It was with this view that the celebrated Tartini has preſented us in 1754 with a treatiſe of harmony, founded on a principle different from that of M. Rameau. This principle is the reſult of a moſt beautiful experiment (†). If at once two different ſounds are produced from two inſtruments of the ſame kind, theſe two ſounds

86 Tartini's experiment.

(D) The *demonſtration* of the principles of harmony by M. Rameau was not thus intitled in the expoſition which he preſented in the year 1749 to the Academy of Sciences, and which that Society beſides approved with all the eulogiums which the author deſerved; the title, as inſerted in the regiſter of the academy, was, "A memorial, in which are explained the foundations of a ſyſtem of muſic theoretical and practical." It is likewiſe under this title that it was announced and approved of by the Commiſſioners, who in their printed report, which the public may read along with M. Rameau's memorial, have never dignified his theory with any other name than that of a *ſyſtem*, the only name in reality which is expreſſive of its nature. M. Rameau, who after the approbation of the Academy, has thought himſelf at liberty to adorn his ſyſtem with the name of a *demonſtration*, did not certainly recollect what the Academy has frequently declared; that, in approving any work, it was by no means implied, that the principles of that work appeared to them demonſtrated. In ſhort, M. Rameau himſelf, in ſome writings poſterior to what he calls his *demonſtration*, acknowledges, that upon particular points in the theory of the muſical art, he is under a neceſſity of having recourſe to analogy and aptitude; this excludes every idea of demonſtration, and reſtores the theory of the muſical art exhibited by M. Romeau to the claſs in which it can only be ranked with propriety, I mean the claſs of probabilities.

(†) Had the utility of the preliminary diſcourſe in which we are now engaged been leſs important and obvious than it really is, we ſhould not have given ourſelves the trouble of tranſlating, nor our readers that of peruſing it. But it muſt be evident to every one, that the cautions here given and the advices offered, are no leſs applicable to ſtudents than to authors. The firſt queſtion here decided is, Whether pure mathematics can be ſucceſsfully applied to the theory of muſic? The author is juſtly of a contrary opinion. It may certainly be doubted with great juſtice, whether the ſolid contents of ſonorous bodies and their degrees of coheſion or elaſticity, can be aſcertained with ſufficient accuracy to render them the ſubjects of muſical ſpeculation, and to determine their effects with ſuch preciſion as may render the concluſions deduced from them geometrically true. It is admitted, that ſound is a ſecondary quality of matter, and that ſecondary qualities have no obvious connection which we can trace with the ſenſations produced by them. Experience therefore, and not ſpeculation, is the grand criterion of muſical phenomena. For the effects of geometry in illuſtrating the theory of muſic (if any will ſtill be ſo credulous as to pay them much attention), the Engliſh reader may conſult Smith's Harmonics, Malcom's Diſſertation on Muſic, and Pleydel's Treatiſe on the ſame ſubject inſerted in a former edition of this work. Our author next treats of the famous diſcovery made by Sig. Tartini, of which the reader may accept the following compendious account.

If two ſounds be produced at the ſame time properly tuned and with due force, from their conjunction a third ſound is generated, ſo much more diſtinctly to be perceived by delicate ears as the relation between the generating ſounds is more ſimple; yet from this rule we muſt except the uniſon and octave. From the fifth is produced a ſound uniſon with its loweſt generator; from the fourth, one which is an octave lower than the higheſt of its generators; from the third major, one which is an octave lower than its loweſt; and from the ſixth ſounds generate* a third different from both the others. They have inſerted in the *Encyclopedie*, under the article *Fundamental*, a detail of this experiment according to M. Tartini; and we owe to the public an information of which in compoſing this article we were ignorant; M. Rameau, a member of the Royal Society at Montpellier, had preſented to that ſociety in the year 1753, before the work of M. Tartini had appeared, a memorial printed the ſame year, and where may be found the ſame experiment diſplayed at full length. In relating this fact, which, it was neceſſary for us to do, it is by no means our intention to detract in any degree from the reputation of M. Tartini; we are perſuaded that he owes this diſcovery to his own reſearches alone: but we think ourſelves obliged in honour to give public teſtimony in favour of him who was the firſt in exhibiting this diſcovery.

87 Its diſcovery originally due to Rameau.

But whatever be the caſe, it is in this experiment that M. Tartini attempts to find the origin of harmony: his book, however, is written in a manner ſo obſcure, that it is impoſſible for us to form any judgement of it; and we are told that others diſtinguiſhed for their knowledge of the ſcience are of the ſame opinion. It were to be wiſhed, that the author would engage ſome man of letters, equally practiſed in muſic and ſkilled in the art of writing, to unfold theſe ideas which he has not diſcovered with ſufficient perſpicuity, and from whence the art might perhaps derive conſiderable advantage if they were placed in a proper light. Of this I am ſo much the more perſuaded, that even though this experiment ſhould not be regarded by others in the ſame view with M. Tartini as the foundation of the muſical art, it is nevertheleſs extremely probable that one might uſe it with the greateſt advantage to enlighten and facilitate the practice of harmony.

In exhorting philoſophers and artiſts to make new attempts for the advancement of the theory of muſic, we ought at the ſame time to let them know the danger of miſtaking what is the real end of their reſearches. Experience is the only foundation upon which they can proceed; it is alone by the obſervation of facts, by bringing them together in one view, by ſhowing their dependency upon one, if poſſible, or at leaſt upon a very ſmall number of primary facts, that they can reach the end to which they ſo ardently aſpire, the important end of eſtabliſhing an exact theory of muſic, where nothing is wanting, nothing obſcure, but every thing diſcovered in its full extent, and in its proper light. The philoſopher who is properly enlightened, will not give himſelf the trouble to explain ſuch facts as are leſs eſſential to his art, becauſe he can diſcern thoſe on which he ought to expatiate for its proper illuſtration. If one would eſtimate them according to their proper value, he will only find it neceſſary to caſt his eyes upon the attempts of natural philoſophers who have diſcovered the greateſt ſkill in their ſcience; to explain, for inſtance, the multiplicity of tones produced by ſonorous bodies. These ſages, after having remarked (what is by no means difficult to conclude) that the univerſal vibration of a muſical ſtring is a mixture of ſeveral partial vibrations, from thence infer, that a ſonorous body ought to produce a multiplicity of tones, as it really does. But why ſhould this multiplied ſound only appear to contain three, and why theſe three preferable to others? Some pretend that there are particles in the air, which, by their different degrees of magnitude and texture, being naturally ſuſceptible of different oſcillations, produce the multiplicity of ſound in queſtion. But what do we know of all this hypothetical doctrine? And though it ſhould even be granted, that there is ſuch a diverſity of tenſion in theſe aerial particles, how ſhould this diverſity prevent them from being all of them confounded in their vibrations by the motions of a ſonorous body? What then ſhould be the reſult, when the vibrations arrive at our ears, but a confuſed and inappretiable† noiſe, where one could not diſtinguiſh any particular ſound?

88 Mechanical concluſions inadequate to the ſituation of muſical phenomena.

89 Metaphyſical concluſions leſs adequate.

If philoſophical muſicians ought not to loſe their time in ſearching for mechanical explications of the phenomena in muſic, explications which will always be found vague and unſatisfactory; much leſs is it their province to exhauſt their powers in vain attempts to riſe above their ſphere into a region ſtill more remote from the proſpect of their faculties, and to loſe themſelves in a labyrinth of metaphyſical ſpeculations upon the cauſes of that pleaſure which we feel from harmony. In vain would they accumulate hypotheſis on hypotheſis, to find a reaſon why ſome chords ſhould pleaſe us

* See Generate.

† See Inapppreciable.

ſixth minor (whoſe higheſt note forms an octave with the loweſt in the third formerly [illegible]) will be produced a ſound lower by a double octave than the higheſt of the leſſer ſixth; from the third minor, one whic is double the diſtance of a greater third from its loweſt; but from the ſixth major (whoſe higheſt note makes an octave to the loweſt in the third minor) will be produced a ſound only lower by double the quantity of a greater third than the higheſt; from the ſecond major, a ſound lower by a double octave from the loweſt from a ſecond minor, a ſound lower by triple the quantity of a third major than the higheſt; from the interval of a diatonic or greater ſemitone, a ſound lower by a triple octave than the higheſt; from that of a minor or chromatic ſemitone, a ſound lower by the quantity of a fifth four times multiplied than the loweſt, &c. &c. But that theſe muſical phænomena may be tried by experiments proper to aſcertain them, two hautboys tuned with ſcrupulous exactneſs muſt be procured, whilſt the muſicians are placed at the diſtance of ſome paces one from the other, and the hearers in the middle. The violin will likewiſe give the ſame chords, but they will be leſs diſtinctly perceived, and the experiment more fallacious, becauſe the vibrations of other ſtrings may be ſuppoſed to enter into it.

If our Engliſh reader ſhould be curious to examine theſe experiments and the deductions made from them in the theory of muſic, he will find them clearly explained and illuſtrated in a treatiſe called *Principles and Power of Harmony*, printed at London 1771.

us more than others. The futility of theſe ſuppoſitions accounts muſt be obvious to every one who has the leaſt penetration. Let us judge of the reſt by the moſt probable which has till now been invented for that purpoſe. Some aſcribe the different degrees of pleaſure which we feel from chords, to the more or leſs frequent coincidence of vibrations; others to the relations which theſe vibrations have among themſelves as they are more or leſs ſimple. But why ſhould this coincidence of vibrations, that is to ſay, their ſimultaneous impulſe on the ſame organs of ſenſation, and the accident of beginning frequently at the ſame time, prove ſo great a ſource of pleaſure? Upon what is this gratuitous ſuppoſition founded? And though one ſhould grant it, would it not follow from thence, that the ſame chord ſhould ſucceſſively and rapidly affect us with contrary ſenſations, ſince the vibrations are alternately coincident and diſcrepant? On the other hand, how ſhould the ear be ſo ſenſible to the ſimplicity of relations, whilſt for the moſt part theſe relations are entirely unknown to him whoſe organs are notwithſtanding ſenſibly affected with the charms of agreeable muſic? We may conceive without difficulty how the eye judges of relations; but how does the ear form ſimilar judgments? Beſides, why ſhould certain chords which are extremely pleaſing in themſelves, ſuch as the fifth, loſe almoſt nothing of the pleaſure which they give us, when they are altered, and of conſequence when the ſimplicity of their relations are deſtroyed; whilſt other chords, which are likewiſe extremely agreeable, ſuch as the third, become harſh almoſt by the ſmalleſt alteration; nay, whilſt the moſt perfect and the moſt agreeable of all chords, I mean the octave, cannot ſuffer the moſt inconſiderable change? Let us in ſincerity confeſs our ignorance concerning the genuine cauſes of theſe effects (†). The metaphyſical conjectures concerning the accouſtic organs are probably in the ſame predicament with thoſe which are formed concerning the organs of viſion, if one may ſpeak ſo, in which philoſophers have even till now made ſuch inconſiderable progreſs, and in all likelihood will not be ſurpaſſed by their ſucceſſors.

Since the theory of muſic, even to thoſe who confine themſelves within its limits, implies queſtions from which every wiſe muſician will abſtain, with much greater reaſon ſhould they avoid idle excurſions beyond the boundaries of that theory, and endeavours to inveſtigate between muſic and the other ſciences chimerical relations which have no foundation in nature. The ſingular opinions advanced upon this ſubject by ſome even of the moſt celebrated muſicians, deſerve not to be reſcued from oblivion, nor refuted; and ought only to be regarded as a new proof how far men of genius may deviate from truth and taſte, when they engage in ſubjects of which they are ignorant.

The rules which we have attempted to eſtabliſh concerning the track which every one ought to purſue in the theory of the muſical art, may ſuffice to ſhow our readers the end which we have propoſed, and which we have endeavoured to attain in this Work. We have nothing to do here (for it is proper that we repeat it), we have nothing to do with the mechanical principles of protracted and harmonic tones produced by ſonorous bodies; principles which till now have been explored in vain, and which perhaps may be long explored with the ſame ſucceſs; we have ſtill

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(†) We have as great an averſion as our author to the explication of muſical phenomena from mechanical principles; yet we fear the following obſervations, deduced from irreſiſtible and univerſal experience, evidently ſhow that the latter neceſſarily depend on the former. It is, for inſtance, univerſally allowed, that diſſonances grate and concords pleaſe a muſical ear: It is likewiſe no leſs unanimouſly agreed, that in proportion as a chord is perfect, the pleaſure is increaſed; now the perfection of a chord conſiſts in the regularity and frequency of coincident oſcillations between two ſonorous bodies impelled to vibrate: thus the third is a chord leſs perfect than the fifth, and the fifth than the octave. Of all theſe conſonances, therefore, the octave is moſt pleaſing to the ear; the fifth next, and the third laſt. In abſolute diſcords, the vibrations are never coincident, and of conſequence a perpetual pulſation or jarring is recognized between the protracted ſounds, which exceedingly hurts the ear; but in proportion as the vibrations coincide, thoſe pulſations are ſuperſeded, and a kindred formed betwixt the two continued ſounds, which delights even the corporeal ſenſe: that relation, therefore, without recogniſing the aptitudes which produce it, muſt be the obvious cauſe of the pleaſure which chords give to the ear. What we mean by coincident vibrations is, that while one ſonorous body performs a given number of vibrations, another performs a different number in the ſame time; ſo that the vibrations of the quickeſt muſt ſometimes be ſimultaneous with thoſe of the ſloweſt, as will plainly appear from the following deduction: Between the extremes of a third, the vibrations of the higheſt are as 5 to 4 of the loweſt; thoſe of the fifth as 3 to 2; thoſe of the octave as 2 to 1. Thus it is obvious, that in proportion to the frequent coincidence of periodical vibrations, the compound ſenſation is more agreeable to the ear. Now, to inquire why that organ ſhould be rather pleaſed with theſe than with the pulſation and tremulous motion of encountering vibrations, which can never coaleſce, would be to aſk why the touch is rather pleaſed with poliſhed than rough ſurfaces? or, why the eye is rather pleaſed with the waving line of Hogarth than with ſharp angles and abrupt or irregular prominences? No alteration of which any chord is ſuſceptible will hurt the ear unleſs it ſhould violate or deſtroy the regular and periodical coincidence of vibrations. When alterations can be made without this diſagreeable effect, they form a pleaſing diverſity; but ſtill this fact corroborates our argument, that in proportion as any chord is perfect, it is impatient of the ſmalleſt alteration; for this reaſon, even in temperament, the octave endures no alteration at all, and the fifth as little as poſſible.

leſs to do with the metaphyſical cauſes of thoſe pleaſing ſenſations which are impreſſed on the mind by harmony; cauſes which are ſtill leſs diſcovered, and which, according to all appearances, will remain latent in perpetual obſcurity. We are alone concerned to ſhow how the chief and moſt eſſential laws of harmony may be deduced from one ſingle experiment; and for which, if we may ſpeak ſo, preceding artiſts have been under a neceſſity of groping in the dark.

With an intention to render this work as generally uſeful as poſſible, I have endeavoured to adapt it to the capacity even of thoſe who are abſolutely uninſtructed in muſic. To accompliſh this deſign, it appeared neceſſary to purſue the following plan.

90 Plan of the treatiſe.

To begin with a ſhort introduction, in which are defined the technical terms moſt frequently uſed in this art; ſuch as *chord*, *harmony*, *key*, *third*, *fifth*, *octave*, &c.

Afterwards to enter into the theory of harmony, which is explained according to M. Rameau, with all poſſible perſpicuity. This is the ſubject of the *Firſt Part;* which, as well as the introduction, preſuppoſes no other knowledge of muſic than that of the names and powers of the ſyllables, *ut*, *re*, *mi*, *fa*, *ſol*, *la*, *ſi*, or C, D, E, F, G, A, B, which all the world knows (†).

The theory of harmony requires ſome arithmetical calculations, which are neceſſary for comparing ſounds one with another. Theſe calculations are very ſhort, extremely ſimple, and conducted in ſuch a manner as to be ſenſibly comprehended by every one; they demand no operation but what is clearly explained, and which every ſchool boy with the ſlighteſt attention may perform. Yet, that even the trouble of this may be ſpared to ſuch as are not diſpoſed to take it, I have not inſerted theſe calculations in the body of the treatiſe, but transferred them to the notes, which the reader may omit, if he can ſatisfy himſelf by taking for granted the propoſitions contained in the work, which will be found proved in the notes.

Theſe calculations I have not endeavoured to multiply; I could even have wiſhed to ſuppreſs them, if it had been poſſible: ſo much did it appear to me to be apprehended that my readers might be miſled upon this ſubject, and might either believe themſelves, or at leaſt ſuſpect me of believing, all this arithmetic neceſſary to form an artiſt. Calculations may indeed facilitate the underſtanding of certain points in the theory, as of the relations between the different notes in the gammut and of the temperament; but the calculations neceſſary for treating of theſe points are ſo ſimple, and, to ſpeak more properly, of ſo little importance, that nothing can require a leſs minute or oſtentatious diſplay. Do not let us imitate thoſe muſicians who, believing themſelves geometers, or thoſe geometers who, believing themſelves muſicians, fill their writings with figures upon figures; imagining, perhaps, that this apparatus is neceſſary to the art. The propenſity of adorning their works with a falſe air of ſcience, can only impoſe upon credulity and ignorance, and ſerve no other purpoſe but to render their treatiſes more obſcure and leſs inſtructive. In the character of a geometer, I think I have ſome right to proteſt here (if I may be permitted to expreſs myſelf in this manner) againſt ſuch ridiculous abuſe of geometry in muſic.

91 Mathematical concluſions not transferable to ſenſible objects without caution.

This I may do with ſo much more reaſon, that in this ſubject the foundations of thoſe calculations are in ſome manner hypothetical, and can never ariſe to a degree of certainty above hypotheſis. The relation of the octave as 1 to 2, that of the fifth as 2 to 3, that of the third major as 4 to 5, &c. are not perhaps the genuine relations eſtabliſhed in nature; but only relations which approach them, and ſuch as experience can diſcover. For are the reſults of experience any thing more but mere approaches to truth?

But happily theſe approximated relations are ſufficient, though they ſhould not be exactly agreeable to truth, for giving a ſatisfactory account of thoſe phenomena which depend on the relations of ſound; as in the difference between the notes in the gammut, of the alterations neceſſary in the fifth and third, of the different manner in which inſtruments are tuned, and other facts of the ſame kind. If the relations of the octave, of the fifth, and of the third, are not exactly ſuch as we have ſuppoſed them, at leaſt no experiments can prove that they are not ſo; and ſince theſe relations are ſignified by a ſimple expreſſion, ſince they are beſides ſufficient for all the purpoſes of theory, it would not only be uſeleſs, but even contrary to ſound philoſophy, ſhould any one incline to invent other relations, to form the baſis of any ſyſtem of muſic leſs eaſy and ſimple than that which we have delineated in this treatiſe.

The *ſecond part* contains the moſt eſſential rules of compoſition*, or in other words the practice of harmony. Theſe rules are founded on the principles laid down in the *firſt part;* yet thoſe who wiſh to underſtand no more than is neceſſary for practice, without exploring the reaſons why ſuch practical rules are neceſſary, may limit the objects of their ſtudy to the *introduction* and the *ſecond part*. They who have read the *firſt part*, will find at every rule contained in the *ſecond*, a reference to that paſſage in the

* See Compoſition.

(†) The names of the ſeven notes uſed by the French are here retained, and will indeed be continued through the whole enſuing work; as we imagine, that, if properly aſſociated with the ſounds which they denominate, they will tend to impreſs theſe ſounds more diſtinctly on the memory of the ſcholar than the letters C, D, E, F, G, A, B, from which characters, except in ſol-fa'ing, the notes in the diatonic ſeries are generally named in Britain. Amongſt us, in the progreſs of intonation, the ſyllables *ut*, *re*, and *ſi*, have been omitted, by which means the teachers of church-muſic have rendered it ſtill more difficult to expreſs by the four remaining denominations the various changes of the ſemitones in the octave. As theſe artificially change their places, the ſeven ſyllables abovementioned alſo diverſify their powers, and are variouſly arranged according to the intervals in which the notes they are intended to ſignify may be placed.

For an account of theſe variations, ſee Rouſſeau's Muſical Dictionary, article GAMME. See alſo the Eſſay towards a Rational Syſtem of Muſic, by John Holden, part i. chap. 1.

the *firſt* where the reaſons for eſtabliſhing that rule are given.

92 Some rules, on account of their intricacy, transferred to the notes

That we may not preſent at once too great a number of objects and precepts, I have transferred to the notes in the ſecond part ſeveral rules and obſervations which are leſs frequently put in practice, which perhaps it may be proper to omit till the treatiſe is read a ſecond time, when the readers is well acquainted with the eſſential and fundamental rules explained in it.

This ſecond part, ſtrictly ſpeaking, preſuppoſes, no more than the firſt, any habit of ſinging, nor even any knowledge of muſic: it only requires that one ſhould know, not even the rules and manner of intonation, but merely the poſition of the notes in the cleff *fa* or F on the fourth line, and that of *ſol* or G upon the ſecond: and even this knowledge may be acquired from the work itſelf; for in the beginning of the ſecond part I explain the poſitions of the cleffs and of the notes. Nothing elſe is neceſſary but to render it a little familiar to our memory, and we ſhall have no more difficulty in it.

93 All the rules of compoſition not to be expected in an elementary eſſay.

It would be wrong to expect here all the rules of compoſition, and eſpecially thoſe which direct the compoſition of muſic in ſeveral parts, and which, being leſs ſevere and indiſpenſable, may be chiefly acquired by practice, by ſtudying the moſt approved models, by the aſſiſtance of a proper maſter, but above all by the cultivation of the ear and of the taſte. This treatiſe is properly nothing elſe, If I may be allowed the expreſſion, but the rudiments of muſic, intended for explaining to beginners the fundamental principles, not the practical detail of compoſition. Thoſe who wiſh to enter more deeply into this detail, will either find it in Mr Rameau's treatiſe of harmony, or in the code of muſic which he publiſhed more lately (I), or laſtly in the explication of the theory and practice of muſic by M. Bethizi (K): this laſt book appears to me clear and methodical.

One may look upon it (with reſpect to a practical detail) as a ſupplement to my own performance. I do this juſtice to the author with ſo much more cheerfulneſs, as he is entirely unkown to me, and as his animadverſions upon my work appear to me leſs ſevere than it deſerved (L).

94 Nature the eſſential miſtreſs of muſical compoſition.

Is it neceſſary to add, that, in order to compoſe muſic in a proper taſte, it is by no means enough to have familiarized with much application the principles explained in this treatiſe? Here can only be learned the mechaniſm of the art; it is the province of nature alone to accompliſh the reſt. Without her aſſiſtance, it is no more poſſible to compoſe agreeable muſic by having read theſe elements, than to write verſes in a proper manner with the Dictionary of Richelet. In one word, it is the elements of muſic alone, and not the principles of genius, that the reader may expect to find in this treatiſe.

Such was the aim I purſued in its compoſition, and ſuch ſhould be the ideas of the reader in its peruſal. Once more let me add, that to the diſcovery of its fundamental principles I have not the remoteſt claim. The ſole end which I propoſed was to be uſeful; to reach that end, I have omitted nothing which appeared neceſſary, and I ſhould be ſorry to find my endeavours unſucceſsful.

DEFINITIONS OF SEVERAL TECHNICAL TERMS.

I. *What is meant by Melody, by Chord, by Harmony, by Interval.*

95 Melody, what.

1. Melody is nothing elſe but a ſeries of ſounds which ſucceed one to another in a manner agreeable to the ear.

96 Chord and harmony, what. See interval.

2. That is called a *chord* which ariſes from the mixture of ſeveral ſounds heard at the ſame time; and harmony is properly a ſeries of chords which in their ſucceſſion one to another delights the ear. A ſingle chord is likewiſe ſometimes called *harmony*, to ſignify the coaleſcence of ſounds which that chord creates, and the ſenſation produced in the ear by that coaleſcence. We ſhall occaſionally uſe the word *harmony* in this laſt ſenſe, but in ſuch a manner as never to leave our meaning ambiguous.

3. In melody and harmony, the diſtance between one ſound and another is called an *interval*; and this is increaſed and diminiſhed as the ſounds between which it intervenes are higher or lower one than the other

4. That we may learn to diſtinguiſh the intervals, and the manner of perceiving them, let us take the ordinary ſcale

ut, re, mi, fa, ſol, la, ſi, UT,
C, D, E, F, G, A, B, C,

which every perſon whoſe ear or voice is not extremely falſe naturally modulates. Theſe are the obſervations which will occur to us in ſinging this gammut.

97 Account of the ſimple intervals,

The ſound *re* is higher or ſharper than the ſound *ut*, the ſound *mi* higher than the ſound *re*, the ſound *fa* higher than the ſound *mi*, &c. and ſo through the whole octave; ſo that the interval or the diſtance from the ſound *ut* to the ſound *re*, is leſs than the interval or diſtance between the ſound *ut* and the ſound *mi*, the interval from *ut* to *mi* is leſs than that between *ut* and *fa*, &c. and in ſhort that the interval from the firſt to the ſecond *ut* is the greateſt of all.—To diſtinguiſh the firſt from the ſecond *ut*, I have marked the laſt with capital letters.

98 The diſtinction between ſtrong and faint, or acute and grave.

5. In general, the interval between two ſounds is proportionably greater, as one of theſe ſounds is higher or lower with relation to the other: but it is neceſſary to obſerve, that two ſounds may be equally high or low, though unequal in their force. The ſtring of a violin touched with a bow produces always a ſound equally high, whether ſtrongly or faintly ſtruck; the ſound will only have a greater or leſſer degree of ſtrength. It is the ſame with vocal modu-

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(I) From my general recommendation of this code, I except the reflections on the principles of ſound which are at the end, and which I ſhould not adviſe any one to read.

(K) Printed at Paris by Lambert in the year 1754.

(L) That criticiſm and my anſwers may be ſeen in the *Journeaux Economiques* of 1752.

lation: let any one form a ſound by gradually impelling or ſwelling the voice, the ſound may be perceived to increaſe in its energy, whilſt it continues always equally low or equally high.

99 Between tonic and ſemitonic intervals.

6. We muſt likewiſe obſerve concerning the ſcale, that the intervals between *ut* and *re*, between *re* and *mi*, between *fa* and *ſol*, between *ſol* and *la*, between *la* and *ſi*, are equal, or at leaſt nearly equal; and that the intervals between *mi* and *fa*, and between *ſi* and *ut*, are likewiſe equal among themſelves, but conſiſt almoſt only of half the former. This fact is known and recogniſed by every one: the reaſon for it ſhall be given in the ſequel: in the mean time every one may aſcertain its reality by the aſſiſtance of an experiment (A).

7. It is for this reaſon that they have called the interval from *mi* to *fa*, and from *ſi* to *ut*, a ſemitone; whereas thoſe between *ut* and *re*, *re* and *mi*, *fa* and *ſol*, *ſol* and *la*, *la*, and *ſi*, are tones.

The *tone* is likewiſe called a *ſecond major* *, and the *ſemitone* a *ſecond minor* †.

* See the figure marked A.

† See Interval.

8. To deſcend or riſe diatonically, is to deſcend or riſe from one ſound to another by the interval of a tone or of a ſemitone, or in general by ſeconds, whether major or minor; as from *re* to *ut*, or from *ut* to *re*, from *fa* to *mi*, or from *mi* to *fa*.

II. *The Terms by which the different Intervals of the Gammut are denominated.*

100 Third minor, what.

9. An interval compoſed of a tone and a ſemitone, as from *mi* to *ſol*, from *la* to *ut*, or from *re* to *fa*, is called a *third minor*.

101 Third major, what.

An interval compoſed of two full tones as from *ut* to *mi*, from *fa* to *la*, or from *ſol* to *ſi*, is called a *third major*.

102 Fourth, what.

An interval compoſed of two tones and a ſemitone, as from *ut* to *fa*, or from *ſol* to *ut* is called a *fourth*.

103 Triton, what.

An interval conſiſting of three full tones, as from *fa* to *ſi*, is called a *triton* or *fourth redundant*.

104 Fifth, what.

An interval conſiſting of three tones and a ſemitone, as from *ut* to *ſol*, from *fa* to *ut*, from *re* to *la*, or from *mi* to *ſi*, &c. is called a *fifth*.

105 Sixth miner, what.

An interval compoſed of three tones and two ſemitones, as from *mi* to *ut*, is called a *ſixth minor*.

106 Sixth major, what.

An interval compoſed of four tones and a ſemitone, as from *ut la*, is called a *ſixth major*

107 Seventh minor, what.

An interval conſiſting of four tones and two ſemitones, as from *re* to *ut* is called a *ſeventh minor*.

108 Seventh, major.

An interval compoſed of five tones and a ſemitone, as from *ut* to *ſi*, is called a *ſeventh major*..

And

(A) This experiment may be eaſily tried. Let any one ſing the ſcale of $\begin{array}{l}\textit{ut, re, mi, fa, ſol, la, ſi, UT,}\\ \text{C, D, E, F, G, A, B, C,}\end{array}$ it will be immediately obſerved without difficulty, that the laſt four notes of the octave $\begin{array}{l}\textit{ſol, la, ſi, UT,}\\ \text{G, A, B, C,}\end{array}$ are quite ſimilar to the firſt *ut, re, mi, fa*; inſomuch, that if, after having ſung this ſcale, one would chooſe to repeat it beginning with *ut* in the ſame tone which was occupied by *ſol* in the former ſcale, the note *re* of the laſt ſcale would have the ſame ſound with the note *la* in the firſt, the *mi* with the *ſi*, and the *fa* with the *ut*.

From whence it follows, that the interval between *ut* and *re* is the ſame as between *ſol* and *la*; between *re* and *mi*, as between *la* and *ſi*; and *mi* and *fa*, as between *ſi* and *ut*.

It will likewiſe be found, that from *re* to *mi*, from *fa* to *ſol*, there is the ſame interval as from *ut* to *re*. To be convinced of this, we need only ſing the ſcale once more; then ſing it again, beginning with *ut*, in this laſt ſcale, in the ſame tone which was given to *re* in the firſt; and it will be perceived, that the *re* in the ſecond ſcale will have the ſame ſound, at leaſt as far as the ear can diſcover, with the *mi* in the former ſcale; from whence it follows, that the difference between *re* and *mi* is, at leaſt as far as the ear can perceive, equal to that between *ut* and *re*. It will alſo be found, that the interval between *fa* and *ſol* is, ſo far as our ſenſe can determine, the ſame with that between *ut* and *re*.

This experiment may perhaps be tried with ſome difficulty by thoſe who are not inured to form the notes and change the key; but ſuch may very eaſily perform it by the aſſiſtance of a harpſichord, by means of which the performer will be ſaved the trouble of retaining the ſounds in one intonation whilſt he performs another. In touching upon this harpſicord the keys *ſol, la, ſi, ut*, and in performing with the voice at the ſame time *ut, re, mi, fa*, in ſuch a manner that the ſame ſound may be given to *ut* in the voice with that of the key *ſol* in the harpſichord, it will be found that *re* in the vocal intonation ſhall be the ſame with *la* upon the harpſichord, &c.

It will be found likewiſe by the ſame harpſichord, that if one ſhould ſing the ſcale beginning with *ut* in the ſame tone with *mi* on the inſtrument, the *re* which ought to have followed *ut*, will be higher by an extremely perceptible degree than the *fa* which follows *mi*: thus it may be concluded,, that the interval between *mi* and *fa* is leſs than between *ut* and *re*; and if one would riſe from *fa* to another ſound which is at the ſame diſtance from *fa* as *fa* from *mi*, he would find in the ſame manner, that the interval from *mi* to this new ſound is almoſt the ſame as that between *ut* and *re*. The interval then from *mi* to *fa* is nearly half of that between *ut* and *re*.

Since then, in the ſcale thus divided $\begin{array}{l}\textit{ut, re, mi, fa}\\ \textit{ſol, la, ſi, Ut,}\end{array}$ the firſt diviſion is perfectly like the laſt; and ſince the intervals between *ut* and *re*, between *re* and *mi*, and between *fa* and *ſol*, are equal; it follows, that the intervals between *ſol* and *la*, and between *la* and *ſi*, are likewiſe equal to every one of the three intervals between *ut* and *re*, between *re* and *mi*, and between *fa* and *ſol*; and that the intervals between *mi* and *fa* and between *ſi* and *ut* are alſo equal, but that they only conſtitute one half of the others.

Definitions.

And in ſhort, an interval conſiſting of five tones and two ſemitones, as from *ut* to *UT*, is called an *octave*.

109 Octave, what.

A great many of the intervals which have now been mentioned, are ſtill ſignified by other names, as may be ſeen in the beginning of the ſecond part; but thoſe which we have now given are the moſt common, and the only terms which our preſent purpoſe demands.

110 Uniſon, what.

10. Two ſounds equally high, or equally low, however unequal in their force, are ſaid to be in *uniſon* one with the other.

11. If two ſounds form between them any interval, whatever it be, we ſay, that the higheſt when aſcending is in that interval with relation to the loweſt; and when deſcending, we pronounce the loweſt in the ſame interval with relation to the higheſt. Thus in the third minor *mi*, *ſol*, where *mi* is the loweſt and *ſol* the higheſt ſound, *ſol* is a third minor from *mi aſcending*, and *mi* is third minor from *ſol in deſcending*.

12. In the ſame manner, if, ſpeaking of two ſonorous bodies, we ſhould ſay, that the one is a fifth above the other *in aſcending*; this infers that the ſound given by the one is at the diſtance of a fifth *aſcending* from the ſound given by the other.

III. *Of Intervals greater than the Octave.*

See fig. B.

13. If, after having ſung the ſcale *ut*, *re*, *mi*, *fa ſol*, *la*, *ſi*, *UT*, one would carry this ſcale ſtill farther in aſcent, it would be diſcovered without difficulty that a new ſcale would be formed, UT, RE, MI, FA, &c. entirely ſimilar to the former, and of which the ſounds will be an octave aſcending, each to its correſpondent note in the former ſcale: thus RE, the ſecond note of the ſecond ſcale, will be an octave in aſcent to the *re* of the firſt ſcale; in the ſame manner MI ſhall be the octave to *mi*, &c. and ſo of the reſt.

Definitions.

111 Ninth, what

14. As there are nine notes from the firſt *ut* to the ſecond RE, the interval between theſe two ſounds is called a *ninth*, and this ninth is compoſed of ſix full tones and two ſemitones. For the ſame reaſon the interval from *ut* to FA is called an *eleventh*, and the interval between *ut* and SOL, a *twelfth*, &c.

112 Eleventh and twelfth what.

It is plain that the *ninth* is the octave of the *ſecond*, the *eleventh* of the *fourth*, and the *twelfth* of the *fifth*, &c.

The octave above the octave of any ſound is called a *double octave* §; the octave of the double octave is called a *triple octave*, and ſo of the reſt.

§ See Interval and Double Octave.

The double octave is likewiſe called a *fifteenth*; and for the ſame reaſon the double octave of the third is called a *ſeventeenth*, the double octave of the fifth a *nineteenth*, &c. (B).

IV. *What is meant by Sharps and Flats.*

113 Sharps and flats, what. See Interval.

15. It is plain that one may imagine the five tones which enter into the ſcale, as divided each into two ſemitones; thus one may advance from *ut* to *re*, forming in his progreſs an intermediate ſound, which ſhall be higher by a ſemitone than *ut*, and lower in the ſame degree than *re*. A ſound in the ſcale is called *ſharp*, when it is raiſed by a ſemitone; and it is marked with this character ✳: thus *ut*✳ ſignifies *ut ſharp*, that is to ſay, *ut* raiſed by a ſemitone above its pitch in the natural ſcale. A ſound in the ſcale depreſſed by a ſemitone is called *flat*, and is marked thus, ♭: thus *la* ♭ ſignifies *la flat*, or *la* depreſſed by a ſemitone.

V. *What is meant by Conſonances and Diſſonances.*

114 Conſonance, what. See Chord.

16. A chord compoſed of ſounds whoſe union or coaleſcence pleaſes the ear is called a *conſonance*; and the ſounds which form this chord are ſaid to be conſonant

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(B) Let us ſuppoſe two vocal ſtrings formed of the ſame matter, of the ſame thickneſs, and equal in their tenſion, but unequal in their length, it will be found by experience.

1ſt, That if the ſhorteſt is equal to half the longeſt, the ſound which it will produce muſt be an octave above the ſound produced by the longeſt.

2dly, That if the ſhorteſt conſtitutes a third part of the longeſt, the ſound which it produces muſt be a twelfth above the ſound produced by the longeſt.

3dly, That if it conſtitutes the fifth part, its ſound will be a ſeventeenth above.

Beſides, it is a truth demonſtrated and generally admitted, that in proportion as one muſical ſtring is leſs than another, the vibrations of the leaſt will be more frequent (that is to ſay, its departures and returns through the ſame ſpace) in the ſame time; for inſtance, in an hour, a minute, a ſecond, &c. in ſuch a manner that one ſtring which conſtitutes a third part of another, forms three vibrations, whilſt the largeſt has only accompliſhed one. In the ſame manner, a ſtring which is one half leſs than another, performs two vibrations, whilſt the other only completes one; and a ſtring which is only the fifth part of another, will perform five vibrations in the ſame time which is occupied by the other in one.

From thence it follows, that the ſound of a ſtring is proportionally higher or lower, as the number of its vibrations is greater or ſmaller in a given time; for inſtance, in a ſecond.

It is for that reaſon, that if we repreſent any ſound whatever by 1, one may repreſent the octave above by 2, that is to ſay, by the number of vibrations formed by the ſtring which produces the octave, whilſt the longeſt ſtring only vibrates once; in the ſame manner we may repreſent the twelfth above the ſound 1 by 3, the ſeventeenth major above 5, &c. But it is very neceſſary to remark, that by theſe numerical expreſſions, we do not pretend to compare ſounds as ſuch; for ſounds in themſelves are nothing but mere ſenſations, and it cannot be ſaid of any ſenſation that it is double or triple to another: thus the expreſſions 1, 2, 3, &c. employed to denominate a ſound, its octave above, its twelfth above, &c. ſignify only, that if a ſtring performs a certain number of vibrations, for inſtance, in a ſecond, the ſtring which is in the octave above ſhall double the number in the ſame time, the ſtring which is in the twelfth above ſhall triple it, &c.

Thus to compare ſounds among themſelves is nothing elſe than to compare among themſelves the numbers of vibrations which are formed in a given time by the ſtrings that produce theſe ſounds.

nant one with relation to the other. The reaſon of this denomination is, that a chord is ſound more perfect, as the ſounds which form it coaleſce more cloſely among themſelves.

17. The octave of a ſound is the moſt perfect of conſonances of which that ſound is ſuſceptible; then the fifth, afterwards the third, &c. This is a fact founded on experiment.

15 Diſſonance, what.

18. A number of ſounds ſimultaneouſly produced whoſe union is diſpleaſing to the ear is called a *diſſonance*, and the ſounds which form it are ſaid to be diſſonant one with relation to the other. The ſecond, the triton, and the ſeventh of a ſound, are diſſonants with relation to it. Thus the ſounds *ut re*, *ut ſi*, or *fa*, *ſi*, &c. ſimultaneouſly heard, form a diſſonance. The reaſon which renders diſſonance diſagreeable, is, that the ſounds which compoſe it, ſeem by no means coaleſcent to the ear, and are heard each of them by itſelf as diſtinct ſounds, though produced at the ſame time.

See Diſcord.

PART I. THEORY OF HARMONY.

CHAP I. *Preliminary and Fundamental Experiments.*

EXPERIMENT I.

19. WHEN a ſonorous body is ſtruck till it gives a ſound, the ear, beſides the principal ſound and its octave, perceives two other ſounds very high, of which one is the twelfth above the principal ſound, that is to ſay, the octave to the fifth of that ſound; and the other is the ſeventeenth major above the ſame ſound, that is to ſay, the double octave of its third major.

20. This experiment is peculiarly ſenſible upon the thick ſtrings of the violoncello, of which the ſound being extremely low, gives to an ear, though not very much practiſed, an opportunity of diſtinguiſhing with ſufficient eaſe and clearneſs the twelfth and ſeventeenth now in queſtion (c).

21. The principal ſound is called the *generator** ; and

* See Generator.

(c) Since the octave above the ſound 1 is 2, the octave below that ſame ſound ſhall be $\frac{1}{2}$; that is to ſay, that the ſtring which produces this octave ſhall have performed half its vibration, whilſt the ſtring which produces the ſound 1 ſhall have completed one. To obtain therefore the octave above any ſound, the operator muſt multiply the quantity which expreſſes the ſound by 2; and to obtain the octave below, he muſt on the contrary divide the ſame quantity by 2.

It is for that reaſon that if any ſound whatever, for inſtance *ut*, is denominated -	1
Its octave above will be - - - - - -	2
Its double octave above - - - - - -	4
Its triple octave above - - - - - -	8
In the ſame manner its octave below will be - - - -	$\frac{1}{2}$
Its double octave below - - - -	$\frac{1}{4}$
Its triple octave below - - - -	$\frac{1}{8}$
And ſo of the reſt.	
Its twelfth above - - - -	3
Its twelfth below - - - -	$\frac{1}{3}$
Its 17th major above - - - -	5
Its 17th major below - - - -	$\frac{1}{5}$

The fifth then above the ſound 1 being the octave beneath the twelfth, ſhall be, as we have immediately obſerved, $\frac{3}{2}$; which ſignifies that this ſtring performs $\frac{3}{2}$ vibrations; that is to ſay, one vibration and a half during a ſingle vibration of the ſtring which gives the ſound 1.

To obtain the fourth above the ſound 1, we muſt take the twelfth below that ſound, and the double octave above that twelfth. In effect, the twelfth below *ut*, for inſtance, is *fa*, of which the double octave *fa* is the fourth above *ut*. Since then the twelfth below 1 is $\frac{1}{3}$, it follows that the double octave above this twelfth, that is to ſay, the fourth from the ſound 1 in aſcending, will be $\frac{1}{3}$ multiplied by 4, or $\frac{4}{3}$.

In ſhort, the third major being nothing elſe but the double octave beneath the ſeventeenth, it follows, that the third major above the ſound 1 will be 5 divided by 4, or in other words $\frac{5}{4}$.

The third major of a ſound, for inſtance the third major *mi*, from the ſound *ut*, and its fifth *ſol*, form between them a third minor *mi*, *ſol*; now *mi* is $\frac{5}{4}$, and *ſol* $\frac{3}{2}$, by what has been immediately demonſtrated: from whence it follows, that the third minor, or the interval between *mi* and *ſol*, ſhall be expreſſed by the relation of the fraction $\frac{5}{4}$ to the fraction $\frac{3}{2}$.

To determine this relation, it is neceſſary to remark, that $\frac{3}{2}$ are the ſame thing with $\frac{12}{8}$, and that $\frac{5}{4}$ are the ſame thing with $\frac{10}{8}$: ſo that $\frac{5}{4}$ ſhall be to $\frac{3}{2}$ in the ſame relation as $\frac{10}{8}$ to $\frac{12}{8}$; that is to ſay, in the ſame relation as 10 to 12, or as 5 to 6. If, then, two ſounds form between themſelves a third minor, and that the firſt is repreſented by 5, the ſecond ſhall be expreſſed by 6; or, what is the ſame thing, if the firſt is repreſented by 1, the ſecond ſhall be expreſſed by $\frac{6}{5}$.

and the two other ſounds which it produces, and with which it is accompanied, are incluſive of its octave, called its *harmonics* §.

116 Generator what.

§ See Harmonics.

Experiment II.

22. There is no perſon inſenſible of the reſemblance which ſubſiſts between any ſound and its octave, whether above or below. Theſe two ſounds when heard together, almoſt entirely coaleſce in the organ of ſenſation. We may beſides be convinced (by two facts which are extremely ſimple) of the facility with which one of theſe ſounds may be taken for the other.

Let it be ſuppoſed that any perſon has an inclination to ſing a tune, and having at firſt begun this air upon a pitch too high or too low for his voice, ſo that he is obliged, leſt he ſhould ſtrain himſelf too much, to ſing the tune in queſtion on a key higher or lower than the firſt; I affirm, that without being initiated in the art of muſic, he will naturally take his new key in the octave below or the octave above the firſt: and that in order to take this key in any other interval except the octave, he will find it neceſſary to exert a ſenſible degree of attention. This is a fact of which we may eaſily be perſuaded by experience.

Another fact. Let any perſon ſing a tune in our preſence, and let it be ſung in a tone too high or too low for our voice; if we wiſh to join in ſinging this air, we naturally take the octave below or above, and frequently, in taking this octave, we imagine it to be the uniſon (D).

Chap. II. *The Origin of the Modes Major and Minor; of the moſt natural Modulation and the moſt perfect Harmony.*

117 Fundamental and harmonics, what.

23. To render our ideas ſtill more preciſe and permanent, we ſhall call the tone produced by the ſonorous body *ut*; it is evident, by the firſt experiment, that this ſound is always attended by its 12th and 17th major; that is to ſay, with the octave of *ſol*, and the double octave of *mi*.

24. This octave of *ſol* then, and this double octave of *mi*, produce the moſt perfect chord which can be joined with *ut*, ſince that chord is the work and choice of nature (E).

118 Harmony reduced to chords, fifths, and octaves.

25. For the ſame reaſon, the modulation formed by *ut* with the octave of *ſol* and the double octave of *mi*, ſung one after the other, would likewiſe be the moſt ſimple and natural of all modulations which do not deſcend or aſcend directly in the diatonic order, if our voices had ſufficient compaſs to form intervals ſo great without difficulty: but the eaſe and freedom with which

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Thus the third minor, an harmonic ſound which is even found on the protracted and coaleſcent tones of a ſonorous body between the ſound *mi* and *ſol*, an harmonic of the principal ſound, may be expreſſed by the fraction $\frac{6}{5}$

N. B. One may ſee by this example, that in order to compare two ſounds one with another which are expreſſed by fractions, it is neceſſary firſt to multiply the numerator of the fraction which expreſſes the firſt by the denominator of the fraction which expreſſes the ſecond, which will give a primary number; as here the numerator 5 of the fraction $\frac{5}{4}$, multiplied by 2 of the fraction $\frac{3}{2}$, has given 10. Afterwards may be multiplied the numerator of the ſecond fraction by the denominator of the firſt, which will give a ſecondary number, as here 12 is the product of 4 multiplied by 3; and the relation between theſe two numbers (which in the preceding example are 10 and 12), will expreſs the relation between theſe ſounds, or, what is the ſame thing, the interval which there is between the one and the other; in ſuch a manner, that the farther the relation between theſe ſounds departs from unity, the greater the interval will be.

Such is the manner in which we may compare two ſounds one with another whoſe numerical value is known. We ſhall now ſhow the manner how the numerical expreſſion of a ſound may be obtained, when the relation which it ought to have with another ſound is known whoſe numerical expreſſion is given.

Let us ſuppoſe, for example, that the third major of the fifth $\frac{3}{2}$ is ſought. That third major ought to be, by what has been ſhown above, the $\frac{5}{4}$ of the fifth; for the third major of any ſound whatever is the $\frac{5}{4}$ of that ſound. We muſt then look for a fraction which expreſſes the $\frac{5}{4}$ of $\frac{3}{2}$; which is done by multiplying the numerators and denominators of both fractions one by the other, from whence reſults the new fraction $\frac{15}{8}$. It will likewiſe be found that the fifth is $\frac{9}{4}$, becauſe the fifth of the fifth is the $\frac{3}{2}$ of $\frac{3}{2}$

Thus far we have only treated of fifths, fourths, thirds major and minor in aſcending; now it is extremely eaſy to find by the ſame rules the fifths, fourths, thirds major and minor in deſcending. For ſuppoſe *ut* equal to 1, we have ſeen that its fifth, its fourth, its third, its major and minor in aſcending, are $\frac{3}{2}$, $\frac{4}{3}$, $\frac{5}{4}$, $\frac{6}{5}$. To find its fifth, its fourth, its third, its major and minor in deſcending, nothing more is neceſſary than to reverſe theſe fractions, which will give $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{6}$.

(D) It is not then imagined that we change the value of a ſound in multiplying or dividing it by 2, by 4, or by 8, &c. the number which expreſſes theſe ſounds, ſince by theſe operations we do nothing but take the ſimple, double, or triple octave, &c. of the ſound in queſtion, and that a ſound coaleſces with its octave.

(E) The chord formed with the twelfth and ſeventeenth major united with the principal ſound, being exactly conformed to that which is produced by nature, is likewiſe for that reaſon the moſt agreeable of all; eſpecially when the compoſer can proportion the voices and inſtruments together in a proper manner to give this chord its full effect. M. Rameau has executed this with the greateſt ſucceſs in the opera of *Pygmalion* page 34 where Pygmalion ſings with the chorus, *L'amour triomphe*, &c.; in this paſſage of the chorus, the two parts of the vocal and inſtrumental baſſes give the principal ſound and its octave; the firſt part above, or treble, and that of the counter-tenor, produce the ſeventeenth major, and its octave, in deſcending; and in ſhort, the ſecond part, or tenor above, gives the twelfth.

which we can ſubſtitute its octave to any ſound, when it is more convenient for the voice, afford us the means of repreſenting this modulation.

119 Mode major, what.

26. It is on this account that, after having ſung the tone *ut*, we naturally modulate the third *mi*, and the fifth *ſol*, inſtead of the double octave of *mi*, and the octave of *ſol*; from whence we form, by joining the octave of the ſound *ut*, this modulation, *ut*, *mi*, *ſol*, *ut*, which in effect is the ſimpleſt and eaſieſt of them all; and which likewiſe has its origin even in the protracted and compounded tones produced by a ſonorous body.

See Mode. See likewiſe Interval.

27. The modulation *ut*, *mi*, *ſol*, *ut*, in which the chord *ut*, *mi*, is a third major, conſtitutes that kind of harmony or melody which we call the *mode major*; from whence it follows, that this mode reſults from the immediate operation of nature.

120 Mode minor, what.

28. In the modulation *ut*, *mi*, *ſol*, of which we have now been treating, the ſounds *mi* and *ſol* are ſo proportioned one to the other, that the principal ſound *ut* (art. 19.) cauſes both of them to reſound; but the ſecond tone *mi* does not cauſe *ſol* to reſound, which only forms the interval of a third minor.

29. Let us then imagine, that, inſtead of this ſound *mi*, one ſhould ſubſtitute between the ſounds *ut* and *ſol* another note which (as well as the ſounds *ut*) has the power of cauſing *ſol* to reſound, and which is, however, different from the ſound *ut*; the ſound which we explore ought to be ſuch, by art. 19. that it may have for its 17th major *ſol*, or one of the octaves of *ſol*; of conſequence the ſound which we ſeek ought to be a 17th major below *ſol*, or, what is the ſame thing, a third major below the ſame *ſol*. Now the ſound *mi* being a third minor beneath *ſol*, and the third major being (art. 9.) greater by a ſemitone than the third minor, it follows, that the ſound of which we are in ſearch ſhall be a ſemitone beneath the natural *mi*, and of conſequence *mi*♭.

30. This new arrangement, *ut*, *mi*♭, *ſol*, in which the ſounds *ut* and *mi*♭ have both the power of cauſing *ſol* to reſound, though *ut* does not cauſe *mi*♭ to reſound, is not indeed equally perfect with the firſt arrangement *ut*, *mi*, *ſol*; becauſe in this the two ſounds *mi* and *ſol* are both the one and the other generated by the principle ſound *ut*; whereas, in the other, the ſound *mi*♭ is not generated by the ſound *ut*; but this arrangement *ut mi*♭, *ſol*, is likewiſe dictated by nature (art. 19.), though leſs immediately than the former; and accordingly experience evinces that the ear accommodates itſelf almoſt as well to the latter as to the former.

4

121 Origin of mode minor. See Mode. See alſo Interval.

31. In this modulation or chord *ut*, *mi*♭, *ſol*, *ut*, it is evident that the third from *ut* to *mi*♭ is minor; and ſuch is the origin of that mode which we call *minor* (F).

122 Perfect chords, what.

32. The moſt perfect chords then are, 1. All chords related one to another, as *ut*, *mi*, *ſol*, *ut*, conſiſting of any ſound of its third major, of its fifth, and of its octave. 2. All chords related one to another, as *ut mi*♭, *ſol*, *ut*, conſiſting of any ſound, of its third minor, of its fifth, and of its octave. In effect, theſe two kinds of chords are exhibited by nature: but the firſt more immediately than the ſecond. The firſt are called *perfect chords major*, the ſecond *perfect chords minor*.

CHAP. III. *Of the Series which the Fifth requires, and of the Laws which it obſerves.*

123 Fundamental baſs, what.

33. SINCE the ſound *ut* cauſes the ſound *ſol* to be heard, and is itſelf heard in the ſound *fa*, which ſounds *ſol* and *fa* are its two-twelfths, we may imagine a modulation compoſed of that ſound *ut* and its two-twelfths, or, which is the ſame thing (art. 22.), of its two-fifths, *fa* and *ſol*, the one below, the other above; which gives the modulation or ſeries of fifths *fa*, *ut*, *ſol*, which I call the *fundamental baſs* of *ut* by fifths.

We ſhall find in the ſequel (Chap. XVIII.), that there may be ſome fundamental baſes by thirds, deduced from the two ſeventeenths, of which the one is an attendant of the principal ſound, and of which the other includes that ſound. But we muſt advance ſtep by ſtep, and ſatisfy ourſelves at preſent to conſider immediately the fundamental baſes by fifths.

34. Thus, from the ſound *ut*, one may make a tranſition indifferently to the ſound *ſol*, or to the ſound *fa*.

35. One may for the ſame reaſon, continue this kind of fifths in aſcending and in deſcending, from *ut*, in this manner:

mi♭, *ſi*♭, *fa*, *ut*, *ſol*, *re*, *la*, &c.

And from this ſeries of fifths one may paſs to any ſound which immediately precedes or follows it.

36. But it is not allowed in the ſame manner to paſs

(F) The origin which we have here given of the mode minor, is the moſt ſimple and natural that can poſſibly be given. In the firſt edition of this treatiſe, I had followed M. Rameau in deducing it from the following experiment.—If you put in vibration a muſical ſtring AB, and if there are at the ſame time contiguous to that two other ſtrings CF, LM, of which the firſt ſhall be a twelfth below the ſtring AB, and the ſecond LM a ſeventeenth major below the ſame AB, the ſtrings CF, LM, will vibrate without being ſtruck as ſoon as the ſtring AB ſhall give a ſound, and divide themſelves by a kind of undulation, the firſt into three, the laſt into five equal parts; in ſuch a manner, that in the vibration of the ſtring CF, you may eaſily diſtinguiſh two points at reſt D, E, and in the tremulous motion of the ſtring LM four acquieſcent points N, O, P, Q, all placed at equal diſtances from each other, and dividing the ſtrings into three or five equal parts. In this experiment, ſays M. Rameau, if we repreſent by *ut* the tone of the ſtring AB, the two other ſtrings will repreſent the tones *fa* and *la*♭; and from thence M. Rameau deduces the modulation *fa*, *la*♭, *ut*, and of conſequence the mode minor. The origin which we have aſſigned to the minor mode in this new edition, appears to me more direct and more ſimple, becauſe it preſuppoſes no other experiment than that of art 19, and becauſe the fundamental ſound *ut* is ſtill retained in both the modes, without being obliged, as M. Rameau found it neceſſary, to change it into *fa*. See fig. C.

Theory of Harmony.

124
Exception to the rule.

paſs from one ſound to another which is not immediately contiguous to it; for inſtance, from *ut* to *re*, or from *re* to *ut:* for this very ſimple reaſon, that the ſound *re* is not contained in the ſound *ut*, nor the ſound *ut* in that of *re;* and thus theſe ſounds have not any alliance the one with the other, which may authorize the tranſition from one to the other.

125
Two perfect chords in ſucceſſion proſcribed.

37. And as theſe ſounds *ut* and *re*, by the firſt experiment, naturally bring along with them the perfect chord; conſiſting of greater intervals *ut*, *mi*, *ſol*, *ut*, *re*, *fa※*, *la*, *re;* hence may be deduced this rule, That two perfect chords, eſpecially if they are major (G), cannot ſucceed one another diatonically in a fundamental baſs; we mean, that in a fundamental baſs two ſounds cannot be diatonically placed in ſucceſſion, each of which, with its harmonics, forms a perfect chord, eſpecially if this perfect chord be major in both.

Chap. IV. *Of Modes in general.*

126
Mode in general, what.

38. A *mode*, in muſic, is nothing elſe but the order of ſounds preſcribed, as well in harmony as melody, by the ſeries of fifths. Thus the three ſounds *fa*, *ut*, *ſol*, and the harmonics of each of theſe three ſounds, that is to ſay, their thirds major and their fifths, compoſe all the major modes which are proper to *ut*.

127
Modes, how repreſented by the ſeries of fifths.

39. The ſeries of fifths then, or the fundamental baſs *fa*, *ut*, *ſol*, of which *ut* holds the middle ſpace, may be regarded as repreſenting the mode of *ut*. One may likewiſe take the ſeries of fifths, or fundamental baſs, *ut*, *ſol*, *re*, as repreſenting the mode of *ſol;* in the ſame manner *ſi* ♭, *fa*, *ut*, will repreſent the mode of *fa*.

By this we may ſee, that the mode of *ſol*, or rather the fundamental baſs of that mode, has two ſounds in common with the fundamental baſs of the mode of *ut*. It is the ſame with the fundamental baſs of the mode *fa*.

128
Principal mode, and adjuncts, what. See Adjunct.

40. The mode of *ut (fa, ut, ſol)* is called the *principal mode* with reſpect to the modes of theſe two fifths, which are called its two *adjuncts*.

129
Modes reliſhed in proportion as their ſounds are common.

41. It is then, in ſome meaſure, indifferent to the ear whether a tranſition be made to the one or to the other of theſe adjuncts, ſince each of them has equally two ſounds in common with the principal mode. Yet the mode of *ſol* ſeems a little more eligible: for *ſol* is heard amongſt the harmonics of *ut*, and of conſequence is implied and ſignified by *ut;* whereas *ut* does not cauſe *fa* to be heard, though *ut* is included in the ſame ſound *fa*. It is hence that the ear, affected by the mode of *ut*, is a little more prepoſſeſſed for the mode of *ſol* than for that of *fa*. Nothing likewiſe is more frequent, nor more natural, than to paſs from the mode of *ut* to that of *ſol*.

130
Dominant and ſubdominant what. See Dominant.

42. It is for this reaſon, as well as to diſtinguiſh the two fifths one from the other, that we call *ſol* the fifth above the generator the *dominant* ſound; and the fifth *fa* beneath the generator the *ſubdominant*.

131
Tranſition to contiguous ſounds, how to be managed

43. It remains to add, as we have ſeen in the preceding chapter, that, in the ſeries of fifths, we may indifferently paſs from one ſound to that which is contiguous: In the ſame manner, and for the ſame reaſon, one may paſs from the mode of *ſol* to the mode of *re*, after having made a tranſition from the mode of *ut* to the mode of *ſol*, as from the mode of *fa* to the mode of *ſi* ♭. But it is neceſſary, however, to obſerve, that the ear which has been immediately affected with the principal mode feels always a ſtrong propenſity to return to it. Thus the further the mode to which we make a tranſition is removed from the principal mode, the leſs time we ought to dwell upon it; or rather, to ſpeak in the terms of the art, the leſs ought the phraſe (‡*aa*) of that mode to be protracted.

Chap. V. *Of the Formation of the Diatonic Scale as uſed by the Greeks.*

44. From this rule, that two ſounds which are contiguous may be placed in immediate ſucceſſion in the ſeries of fifths, *fa*, *ut*, *ſol*, it follows, that one may form this modulation, or this fundamental baſs, by fifths, *ſol*, *ut*, *ſol*, *ut*, *fa*, *ut*, *fa*.

See fig. D.
132
Formation of the Greek diatonic ſcale by the fundamental baſs.

45. Each of the ſounds which forms this modulation brings neceſſarily along with itſelf its third major, its fifth, and its octave; inſomuch that he who, for inſtance, ſings the note *ſol*, may be reckoned to ſing at the ſame time the notes *ſol*, *ſi*, *re*, *ſol:* in the ſame manner the ſound *ut* in the fundamental baſs brings along with it this modulation, *ut*, *mi*, *ſol*, *ut;* and, in ſhort, the ſame ſound *fa* brings along with it *fa*, *la*, *ut*, *fa*. This modulation then, or this fundamental baſs,

ſol, *ut*, *ſol*, *ut*, *fa*, *ut*, *fa*,

gives the following diatonic ſeries,

ſi, *ut*, *re*, *mi*, *fa*, *ſol*, *la;*

See D.

which is preciſely the diatonic ſcale of the Greeks. We are ignorant upon what principles they had formed this ſcale; but it may be ſenſibly perceived, that that ſeries ariſes from the baſs *ſol*, *ut*, *ſol*, *ut*, *fa*, *ut*, *fa;* and that of conſequence this baſs is juſtly called *fundamental*, as being the real primitive modulation, that which

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(G) I ſay *eſpecially if they are major;* for in the major chord *re*, *fa※*, *la*, *re*, beſides that the ſounds *ut* and *re* have no common harmonical relation, and are even diſſonant between themſelves (Art. 18.), it will likewiſe be found, that *fa※* forms a diſſonance with *ut*. The minor chord, *re*, *fa*, *la*, *re*, would be more tolerable, becauſe the natural *fa* which occurs in this chord carries along with it its fifth *ut*, or rather the octave of that fifth: It has likewiſe been ſometimes the practice of compoſers, though rather by a licence indulged them than ſtrictly agreeable to their art, to place a minor in diatonic ſucceſſion to a major chord.

(‡*aa*) As the mere Engliſh reader, unacquainted with the technical phraſeology of muſic, may be ſurpriſed at the uſe of the word *phraſe* when transferred from language to that art, we have thought proper to inſert the definition of Rouſſeau.

A *phraſe*, according to him, is in melody a ſeries of modulations, or in harmony a ſucceſſion of chords, which form without interruption a ſenſe more or leſs complete, and which terminate in a repoſe by a cadence more or leſs perfect.

conducts the ear, and which it feels to be implied in the diatonic modulation, *ſi*, *ut*, *re*, *mi*, *fa*, *ſol*, *la*, (H).

46. We ſhall be ſtill more convinced of this truth by the following remarks.

In the modulation *ſi*, *ut*, *re*, *mi*, *fa*, *ſol*, *la*, the ſounds *re* and *fa* form between themſelves a third minor, which is not ſo perfectly true as that between *mi* and *ſol* (I). Nevertheleſs, this alteration in the third minor between *re* and *fa* gives the ear no pain, becauſe that *re* and that *fa*, which do not form between themſelves a true third minor, form, each in particular, conſonances perfectly juſt with the ſounds in the fundamental baſs which correſpond with them: for *re* in the ſcale is the true fifth of *ſol*, which anſwers to it in the fundamental baſs; and *fa* in the ſcale is the true octave of *fa*, which anſwers to it in the ſame baſs.

133
Altered intervals, no objection.

47. If, therefore, theſe ſounds in the ſcale form conſonances perfectly true with the notes which correſpond to them in the fundamental baſs, the ear gives itſelf little trouble to inveſtigate the alterations which there may be in the intervals which theſe ſounds in the ſcale form between themſelves. This is a new proof that the fundamental baſs is the genuine guide of the ear, and the true origin of the diatonic ſcale.

134
Reaſons why this ſcale includes only ſeven ſounds.

48. Moreover, this diatonic ſcale includes only ſeven ſounds, and goes no higher than *ſi*, which would be the octave of the firſt: a new ſingularity, for which a reaſon may be given by the principles above eſtabliſhed. In reality, in order that the ſound *ſi*, may ſucceed immediately in the ſcale to the ſound *la*, it is neceſſary that the note *ſol*, which is the only one from whence *ſi* as a harmonic may be deduced, ſhould immediately ſucceed to the ſound *fa*, in the fundamental baſs, which is the only one from whence *la* can be harmonically deduced. Now, the diatonic ſucceſſion from *fa* to *ſol* cannot be admitted in the fundamental baſs, according to what we have remarked (art. 36.) The ſounds *la* and *ſi*, then, cannot immediately ſucceed one another in the ſcale: we ſhall ſee in the ſequel why this is not the caſe in the ſeries *ut*, *re*, *mi*, *fa*, *ſol*, *la*, *ſi*, *UT*, which begins upon *ut*; whereas the ſcale in queſtion here begins upon *ſi*.

135
Completion of the Greek octave. See Proſlambanomene.

49. The Greeks likewiſe, to form an entire octave, added below the firſt *ſi* the note *la*, which they diſtinguiſhed and ſeparated from the reſt of the ſcale, and which for that reaſon they called *proſlambanomene*, that is to ſay, a ſtring or note ſubadded to the ſcale, and put before *ſi* to form the entire octave.

136
The ſcale compoſed of two ſimilar conjunctive tetrachords.

50. The diatonic ſcale *ſi*, *ut*, *re*, *mi*, *fa*, *ſol*, *la*, is compoſed of two tetrachords, that is to ſay, of two diatonic ſcales, each conſiſting of four ſounds, *ſi*, *ut*, *re*, *mi*, and *mi*, *fa*, *ſol*, *la*. Theſe two tetrachords are exactly ſimilar; for from *mi* to *fa* there is the ſame interval as from *ſi* to *ut*, from *fa* to *ſol* the ſame as from *ut* to *re*, from *ſol* to *la* the ſame as from *re* to *mi*

(H) Nothing is eaſier than to find in this ſcale the value or proportions of each ſound with relation to the ſound *ut*, which we call 1; for the two ſounds *ſol* and *fa* in the baſs are $\frac{3}{2}$ and $\frac{2}{3}$; from whence it follows,

1. That *ut* in the ſcale is the octave of *ut* in the baſs; that is to ſay, 2.
2. That *ſi* is the third major of *ſol*; that is to ſay $\frac{5}{4}$ of $\frac{3}{2}$ (note C), and of conſequence $\frac{15}{8}$.
3. That *re* is the fifth of *ſol*; that is to ſay $\frac{3}{2}$ of $\frac{3}{2}$, and of conſequence $\frac{9}{4}$.
4. That *mi* is the third major of the octave of *ut*, and of conſequence the double of $\frac{5}{4}$; that is to ſay, $\frac{5}{2}$.
5. That *fa* is the double octave of *fa* of the baſs, and conſequently $\frac{8}{3}$.
6. That *ſol* of the ſcale is the octave of *ſol* of the baſs, and conſequently 3.
7. In ſhort, that *fa* in the ſcale is the third major of *fa* of the ſcale; that is to ſay, $\frac{5}{4}$ of $\frac{8}{3}$, or $\frac{10}{3}$.

Hence then will reſult the following table, in which each ſound has its numerical value above or below it.

Diatonic Scale.	$\frac{15}{8}$	2	$\frac{9}{4}$	$\frac{5}{2}$	$\frac{8}{3}$	3	$\frac{10}{3}$
	ſi,	*ut*,	*re*,	*mi*,	*fa*,	*ſol*,	*la*.
Fundamental Baſs.	*ſol*,	*ut*,	*ſol*,	*ut*,	*fa*,	*ut*,	*fa*.
	$\frac{3}{2}$	1	$\frac{3}{2}$	1	$\frac{2}{3}$	1	$\frac{2}{3}$

And if, for the conveniency of calculation, we chooſe to call the ſound *ut*, of the ſcale 1; in this caſe there is nothing to do but to divide each of the numbers by 2, which repreſent the diatonic ſcale, and we ſhall have

$\frac{15}{16}$	1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$
ſi,	*ut*,	*re*,	*mi*,	*fa*,	*ſol*,	*la*.

(I) In order to compare *re* with *fa*, we need only compare $\frac{9}{8}$ with $\frac{4}{3}$; the relation between theſe fractions will be (Note C) that of 9 times 3 to 8 times 4; that is to ſay, of 27 to 32: the third minor, then, from *re* to *fa*, is not true; becauſe the proportion of 27 to 32 is not the ſame with that of 5 to 6, theſe two proportions being between themſelves as 27 times 6 is to 32 times 5, that is to ſay, as 162 to 160, or as the halves of theſe two numbers, that is to ſay, as 81 to 80.

M. Rameau, when he publiſhed, in 1726, his *New theoretical and practical Syſtem of Muſic*, had not as yet found the true reaſon of the alteration in the conſonance which is between *re* and *fa*, and of the little attention which the ear pays to it. For he pretends, in the work now quoted, that there are two thirds minor, one in the proportion of 5 to 6, the other in the proportion of 27 to 32. But the opinion which he has afterwards adopted, ſeems much preferable. In reality, the genuine third minor, is that which is produced by nature between *mi* and *ſol*, in the continued tone of thoſe ſonorous bodies of which *mi* and *ſol* are the two harmonics; and that third minor, which is in the proportion of 5 to 6, is likewiſe that which takes place in the minor mode, and not that third minor which is falſe and different, being in the proportion of 27 to 32.

mi (L); this is the reaſon why the Greeks diſtinguiſhed theſe two tetrachords; yet they joined them by the note *mi*, which is common to both, and which gave them the name of *conjunctive tetrachords*.

137 Intervals in both tetrachords equal.

51. Moreover, the intervals between any two ſounds, taken in each tetrachord in particular, are preciſely true: thus, in the firſt tetrachord, the intervals of *ut mi*, and *ſi, re*, are thirds, the one major and the other minor, exactly true, as well as the fourth *ſi mi* (M); it is the ſame thing with the tetrachord *mi, fa, ſol, la*, ſince this tetrachord is exactly like the former

138 Intervals between the notes of different tetrachords diſſimilar.

52. But the caſe is not the ſame when we compare two ſounds taken each from a different tetrachord; for we have already ſeen, that the note *re* in the firſt tetrachord forms with the note *fa* in the ſecond a third minor, which is not true. In like manner it will be found, that the fifth from *re* to *la* is not exactly true, which is evident; for the third major from *fa* to *la* is true, and the third minor from *re* to *fa* is not ſo: now, in order to form a true fifth, a third major and a third minor, which are both exactly true, are neceſſary.

139 Another reaſon for diſtinguiſhing the ſcale into two tetrachords.

53. From thence it follows, that every conſonance is abſolutely perfect in each tetrachord taken by itſelf; but that there is ſome alteration in paſſing from one tetrachord to the other. This is a new reaſon for diſtinguiſhing the ſcale into theſe two tetrachords.

140 The ſource of tones major and minor inveſtigated.

54. It may be aſcertained by calculation, that in the tetrachord *ſi, ut, re, mi*, the interval, or the tone from *re* to *mi*, is a little leſs than the interval or tone from *ut* to *re* (N). In the ſame manner, in the ſecond tetrachord *mi, fa, ſol, la*, which is, as we have proved, perfectly ſimilar to the firſt, the note from *ſol* to *la* is a little leſs than the note from *fa* to *ſol*. It is for this reaſon that they diſtinguiſh two kinds of tones; the greater tone*, as from *ut* to *re*, from *fa* to *ſol*, &c.; and the leſſer†, as from *re* to *mi*, from *ſol* to *la*, &c.

* Greater tone. See Interval.
† Leſſer tone. See Interval.

CHAP. VI. *The formation of the Diatonic Scale among the Moderns, or the ordinary Gammut.*

141 The modern ſcale, how formed.

55. We have juſt ſhown in the preceding chapter, how the ſcale of the Greeks is formed, *ſi, ut, re, mi, fa, ſol, la*, by means of a fundamental baſs compoſed of three ſounds only, *fa, ut, ſol*: but to form the ſcale *ut, re, mi, fa, ſol, la, ſi, UT*, which we uſe at preſent, we muſt neceſſarily add to the fundamental baſs the note *re*, and form, with theſe four ſounds *fa, ut, ſol, re*, the following fundamental baſs:

ut, ſol, ut, fa, ut, ſol, re, ſol, ut; See fig. E.

from whence we deduce the modulation or ſcale See Scale.

ut, re, mi, fa, ſol, la, ſi, UT.

In effect (O), *ut* in the ſcale belongs to the harmony of *ut* which correſponds with it in the baſs; *re*, which is the ſecond note in the gammut, is included in the harmony of *ſol*, the ſecond note of the baſs; *mi*, the third note of the gammut, is a natural harmonic of *ut*, which is the third ſound in the baſs, &c.

142 The Greek diatonic ſcale ſimpler than ours, and why.

56. From thence it follows, that the diatonic ſcale of the Greeks is, at leaſt in ſome reſpects, more ſimple than ours; ſince the ſcale of the Greeks (chap. v.) may be formed alone from the mode proper to *ut*; whereas ours is originally and primitively formed, not only from the mode of *ut* (*fa, ut, ſol*), but likewiſe from the mode of *ſol*, (*ut, ſol, re*).

It will likewiſe appear, that this laſt ſcale conſiſts of two parts; of which the one, *ut, re, mi, fa, ſol*, is in the

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(L) The proportion of *ſi* to *ut* is as $\frac{15}{16}$ to 1, that is to ſay as 15 to 16; that betwen *mi* and *fa* is as $\frac{5}{4}$ to $\frac{4}{3}$, that is to ſay (note C), as 5 times 3 to 4 times 4, or as 15 to 16: theſe two proportions then are equal. In the ſame manner, the proportion of *ut* to *re* is as 1 to $\frac{9}{8}$, or as 8 to 9; that between *fa* and *ſol* is as $\frac{4}{3}$ to $\frac{3}{2}$; that is to ſay (note C), as 8 to 9. The proportion of *mi* to *ut* is as $\frac{5}{4}$ to 1, or as 5 to 4; that between *fa* and *la* is as $\frac{5}{3}$ to $\frac{4}{3}$, or as 5 to 4: the proportions here then are likewiſe equal.

(M) The proportion of *mi* to *ut* is as $\frac{5}{4}$ to 1, or as 5 to 4, which is a true third major; that from *re* to *ſi* is as $\frac{9}{8}$ to $\frac{15}{16}$, that is to ſay, as 9 times 16 to 15 times 8, or as 9 times 2 to 15, or as 6 to 5. In like manner, we ſhall find, that the proportion of *mi* to *ſi* is as $\frac{5}{4}$ to $\frac{15}{16}$; that is to ſay, as 5 times 16 to 15 times 4, or as 4 to 3, which is a true fourth.

(N) The proportion of *re* to *ut* is as $\frac{9}{8}$ to 1, or as 9 to 8; that of *mi* to *re* is as $\frac{5}{4}$ to $\frac{9}{8}$, that is to ſay, as 40 to 36, or as 10 to 9: now $\frac{10}{9}$ is leſs removed from unity than $\frac{9}{8}$; the interval then from *re* to *mi* is a little leſs than that from *ut* to *re*.

If any one would wiſh to know the proportion which $\frac{10}{9}$ bear to $\frac{9}{8}$, he will find (note C) that it is as 8 times 10 to 9 times 9, that is to ſay, as 80 to 81. Thus the proportion of a leſſer to a greater tone is as 80 to 81; this difference between the greater and leſſer tone is what the Greeks called a *comma*.

We may remark, that this difference of a comma is found between the third minor when true and harmonical, and the ſame chord when it ſuffers alteration *re fa*, of which we have taken notice in the ſcale (note I); for we have ſeen, that this third minor thus altered is in the proportion of 80 to 81 with the true third minor.

(O) The values or eſtimates of the notes ſhall be the ſame in this as in the former ſcale, excepting only the tone *la*; for *re* being repreſented by $\frac{9}{8}$, its fifth will be expreſſed by $\frac{27}{16}$; ſo that the ſcale will be numerically ſignified thus:

$$\begin{array}{cccccccc} 1 & \frac{9}{8} & \frac{5}{4} & \frac{4}{3} & \frac{3}{2} & \frac{27}{16} & \frac{15}{8} & 2 \\ ut, & re, & mi, & fa, & ſol, & la, & ſi, & UT. \end{array}$$

Where you may ſee, that the note *la* of this ſcale is different from that in the ſcale of the Greeks; and that the *la* in the modern ſeries ſtands in proportion to that of the Greeks as $\frac{27}{16}$ to $\frac{5}{3}$, that is to ſay, as 81 to 80; theſe two *la's* then likewiſe differ by a *comma*.

the mode of *ut*; and the other *ſol*, *la*, *ſi*, *ut*, in that of *ſol*.

143
The note ſol twice repeated in the diatonic ſcale from its harmonic relations to the fundamental baſs.

57. It is for this reaſon that the note *ſol* is found to be twice repeated in immediate ſucceſſion in this ſcale; once as the fifth of *ut*, which correſponds with it in the fundamental baſs; and again, as the octave of *ſol*, which immediately follows *ut* in the ſame baſs. As to what remains, theſe two conſecutive *ſol*'s are otherwiſe in perfect uniſon. It is for this reaſon that we are ſatisfied with ſinging only one of them when one modulates the ſcale *ut*, *re*, *mi*, *fa*, *ſol*, *la*, *ſi*, *UT*: but this does not prevent us from employing a pauſe or repoſe, expreſſed or underſtood, after the ſound *fa*. There is no perſon who does not perceive this, whilſt he himſelf ſings the ſcale.

144
The modern ſcale compoſed of two disjunctive tetrachords of different modes.

58. The ſcale of the moderns, then, may be conſidered as conſiſting of two tetrachords, disjunctive indeed, but perfectly ſimilar one to the other, *ut*, *re*, *mi*, *fa*, and *ſol*, *la*, *ſi*, *ut*, one in the mode of *ut*, the other in that of *ſol*. For what remains, we ſhall ſee in the ſequel by what artifice one may cauſe the ſcale *ut*, *re*, *mi*, *fa*, *ſol*, *la*, *ſi*, *UT*, to be regarded as belonging to the mode of *ut* alone. For this purpoſe it is neceſſary to make ſome changes in the fundamental baſs, which we have already aſſigned: but this ſhall be explained at large in chap. xiii.

145
The mode of ſol introduced in the fundamental baſs productive of conveniences.

59. The introduction of the mode proper to *ſol* in the fundamental baſs has this happy effect, that the notes *fa*, *ſol*, *la*, *ſi*, may immediately ſucceed each other in aſcending the ſcale, which cannot take place (art. 48.) in the diatonic ſeries of the Greeks, becauſe that ſeries is formed from the mode of *ut* alone. From whence it follows:

1. That we change the mode at every time when we modulate three notes in ſucceſſion.

2. That if theſe three notes are ſung in ſucceſſion in the ſcale *ut*, *re*, *mi*, *fa*, *ſol*, *la*, *ſi*, *UT*, this cannot be done but by the aſſiſtance of a pauſe expreſſed or underſtood after the note *fa*; inſomuch, that the three tones *fa*, *ſol*, *la*, *ſi*, (three only becauſe the note *ſol* which is repeated is not enumerated) are ſuppoſed to belong to two different tetrachords.

146
Change of mode the cauſe of the difficulty in ſinging three conſecutive tones aſcending.

60. It ought not then any longer to ſurpriſe us, that we feel ſome difficulty whilſt we aſcend the ſcale in ſinging three tones in ſucceſſion, becauſe this is impracticable without changing the mode; and if one pauſes in the ſame mode, the fourth ſound above the firſt note will never be higher than a ſemitone above that which immediately precedes it; as may be ſeen by *ut*, *re*, *mi*, *fa*, and by *ſol*, *la*, *ſi*, *ut*, where there is no more than a ſemitone between *mi* and *fa*, and between *ſi* and *ut*.

147
Intervals, though altered in themſelves, form true conſonances with the fundamental baſs.

61. We may likewiſe obſerve in the ſcale *ut*, *re*, *mi*, *fa*, that the third minor from *re* to *fa* is not true, for the reaſons which have been already given (art. 49.). It is the ſame caſe with the third minor from *la* to *ut*, and with the third major from *fa* to *la*: but each of theſe ſounds form otherwiſe conſonances perfectly true, with their correſpondent ſounds in the fundamental baſs.

62. The thirds *la ut*, *fa la*, which were true in the former ſcale, are falſe in this; becauſe in the former ſcale *la* was the third of *fa*, and here it is the fifth of *re*, which correſponds with it in the fundamental baſs.

148
Fewer altered conſonances in the Greek ſcale than in ours.

63. Thus it appears, that the ſcale of the Greeks contains fewer conſonances that are altered than ours (P); and this likewiſe happens from the introduction of the mode of *ſol* into the fundamental baſs (Q).

We ſee likewiſe that the value of *la* in the diatonic ſcale, a value which authors have been divided in aſcertaining, ſolely depends upon the fundamental baſs, and that it muſt be different according as the note *la* has *fa* or *re* for its baſs. See the note (O).

Chap. VII. *Of Temperament.*

149
Temperament, why neceſſary.

64. The alterations which we have obſerved in the intervals between particular ſounds of the diatonic ſcale, naturally lead us to ſpeak of temperament. To give a clear idea of this, and to render the neceſſity of it palpable, let us ſuppoſe that we have before us an inſtrument with keys, a harpſichord, for inſtance, conſiſting of ſeveral octaves or ſcales, of which each includes its twelve ſemitones.

(P) In the ſcale of the Greeks, the note *la* being a third from *fa*, there is an altered fifth between *la* and *re*: but in ours, *la* being a fifth to *re*, produces two altered thirds, *fa la*, and *la ut*; and likewiſe a fifth altered, *la mi*, as we ſhall ſee in the following chapter. Thus there are in our ſcale two intervals more than in the ſcale of the Greeks which ſuffer alteration.

(Q) But here it may be with ſome colour objected: The ſcale of the Greeks, it may be ſaid, has a fundamental baſs more ſimple than ours; and beſides, in it there are fewer chords which will not be found exactly true: why then, notwithſtanding this, does ours appear more eaſy to be ſung than that of the Greeks? The Grecian ſcale begins with a ſemitone, whereas the intonation prompted by nature ſeems to impel us to riſe by a full tone at once. This objection may be thus anſwered. The ſcale of the Greeks is indeed better diſpoſed than ours for the ſimplicity of the baſs, but the arrangement of ours is more ſuitable to natural intonation. Our ſcale commences by the fundamental ſound *ut*, and it is in reality from that ſound that we ought to begin; it is from this that all the others naturally ariſe, and opon this that they depend; nay, if I may ſpeak ſo, in this they are included: on the contrary, neither the ſcale of the Greeks, nor its fundamental baſs, commences with *ut*; but it is from this *ut* that we muſt depart, in order to regulate our intonation, whether in riſing or deſcending: now, in aſcending from *ut*, the intonation, even of the Greek ſcale, gives the ſeries *ut*, *re*, *mi*, *fa*, *ſol*, *la*: and ſo true is it that the fundamental ſound *ut* is here the genuine guide of the ear, that if, before we modulate the ſound *ut*, we ſhould attempt to riſe to it by that note in the ſcale which is moſt immediately contiguous, we cannot reach it but by the note *ſi*, and by the ſemitone from *ſi* to *ut*. Now to make a tranſition from *ſi* to *ut*, by this ſemitone, the ear muſt of neceſſity be prediſpoſed for that modulation, and conſequently preoccupied with the mode of *ut*: if this were not the caſe, we ſhould naturally riſe from *ſi* to *ut*※, and by this operation paſs into another mode.

Theory of Harmony.

See fig. F.

Let us chooſe in that harpſichord one of the ſtrings which will ſound the note UT, and let us tune the ſtring SOL to a perfect fifth with UT in aſcending; let us afterwards tune to a perfect fifth with this SOL the RE which is above it; we ſhall evidently perceive that this RE will be in the ſcale above that from which we ſet out: but it is alſo evident that this RE muſt have in the ſcale a *re* which correſponds with it, and which muſt be tuned a true octave below RE; and between this and SOL there ſhould be the interval of a fifth; ſo that the *re* in the firſt ſcale will be a true fourth below the SOL of the ſame ſcale. We may afterwards tune the note LA of the firſt ſcale to a juſt fifth with this laſt *re;* then the note MI in the higheſt ſcale to a true fifth with this new LA, and of conſequence the *mi* in the firſt ſcale to a true fourth beneath this ſame LA: Having finiſhed this operation, it will be found that the laſt *mi,* thus tuned, will by no means form a juſt third major from the ſound UT (R): that is to ſay, that it is impoſſible for *mi* to conſtitute at the ſame time the third major of UT and the true fifth of LA; or, what is the ſame thing, the true fourth of LA in deſcending.

65. What is ſtill more, if, after having ſucceſſively and alternately tuned the ſtrings UT, SOL, *re*, LA, *mi*, in perfect fifths and fourths one from the other, we continue to tune ſucceſſively by true fifths and fourths the ſtrings *mi*, *ſi*, *fa※*, *ut※*, *ſol※*, *re※*, *mi※*, *ſi※*; we ſhall find, that, though *ſi※*, being a ſemitone higher than the natural note, ſhould be equivalent to UT natural, it will by no means form a juſt octave to the firſt *ut* in the ſcale, but be conſiderably higher (s); yet this *ſi※* upon the harpſichord ought not to be different from the octave above UT; for every *ſi※* and every UT is the ſame ſound, ſince the octave or the ſcale only conſiſts of twelve ſemitones.

104 Reaſons and rules for temperament.

66. From thence it neceſſarily follows, 1. That it is impoſſible that all the octaves and all the fifths ſhould be juſt at the ſame time, particularly in inſtruments which have keys, where no intervals leſs than a ſemitone are admitted. 2. That, of conſequence, if the fifths are juſtly tuned, ſome alteration muſt be made in the octaves; now the ſympathy or ſound which ſubſiſts between any note and its octave, does not permit us to make ſuch an alteration: this perfect coaleſcence of ſound is the cauſe why the octave

T* ſhould

(R) The LA conſidered as the fifth of *re* is $\frac{27}{16}$, and the fourth beneath this LA will conſtitute $\frac{3}{4}$ of $\frac{27}{16}$, that is to ſay, $\frac{81}{64}$; $\frac{81}{64}$ then ſhall be the value of *mi*, conſidered as a true fourth from LA in deſcending: now *mi*, conſidered as the third major of the ſound UT, is $\frac{5}{4}$, or $\frac{80}{64}$: theſe two *mi*'s then are between themſelves in the proportion of 81 to 80; thus it is impoſſible that *mi* ſhould be at the ſame time a perfect third major from UT, and a true fourth beneath LA.

(s) In effect, if you thus alternately tune the fifth above, and the fourth below, in the ſame octave, you may here ſee what will be the proceſs of your operation.

UT, SOL, a fifth; *re* a fourth; LA a fifth; *mi* a fourth; *ſi* a fifth; *fa※* a fourth; *ut※* a fifth; *ſol※* a fourth; RE※ a fifth; *la※* a fourth; MI※ or FA a fifth; ※ a fourth: now it will be found, by a very eaſy computation, that the firſt UT being repreſented by 1, SOL ſhall be $\frac{3}{2}$, *re* $\frac{9}{8}$, LA $\frac{27}{16}$, *mi* $\frac{81}{64}$, &c. and ſo of the reſt till you arrive at *ſi※*, which will be found $\frac{531441}{262144}$. This fraction is evidently greater than the number 2, which expreſſes the perfect octave *ut* to its correſpondent UT; and the octave below *ſi※* would be one half of the ſame fraction, that is to ſay $\frac{531441}{524288}$, which is evidently greater than UT repreſented by unity. This laſt fraction $\frac{531441}{524288}$ is compoſed of two numbers; the numerator of the fraction is nothing elſe but the number 3 multiplied 11 times in ſucceſſion by itſelf, and the denominator is the number 2 multiplied 13 times in ſucceſſion by itſelf. Now it is evident, that this fraction, which expreſſes the value of *ſi※*, is not equal to the unity which expreſſes the value of the ſound UT: though, upon the harpſichord, *ſi※* and UT are identical. This fraction riſes above unity by $\frac{7153}{524288}$, that is to ſay, by about $\frac{1}{73}$; and this difference was called the *comma of Pythagoras.* It is palpable that this comma is much more conſiderable than that which we have already mentioned (note N), and which is only $\frac{1}{80}$.

We have already proved that the ſeries of fifths produces an *ut* different from *ſi※*, the ſeries of thirds major gives another ſtill more different. For, let us ſuppoſe this ſeries of thirds, *ut*, *mi*, *ſol※*, *ſi※*, we ſhall have *mi* equal to $\frac{5}{4}$, *ſol※* to $\frac{25}{16}$, and *ſi※* to $\frac{125}{64}$, whoſe octave below is $\frac{125}{128}$; from whence it appears, that this laſt *ſi※* is leſs than unity (that is to ſay, than *ut*), by $\frac{3}{128}$, or by $\frac{1}{42}$, or near it: A new comma, much greater than the preceding, and which the Greeks have called *apotome major.*

It may be obſerved, that this *ſi※*, deduced from the ſeries of thirds, is to the *ſi※* deduced from the ſeries of fifths, as $\frac{125}{128}$ is to $\frac{531441}{524288}$; that is to ſay, in multiplying by 524288, as 125 multiplied by 4096 is to 531441, or as 512000 to 531441, that is to ſay, nearly as 26 is to 27: from whence it may be ſeen, that theſe two *ſi*'s※ are very conſiderably different one from the other, and even ſufficiently different to make the ear ſenſible of it; becauſe the difference conſiſts almoſt of a minor ſemitone, whoſe value, as will afterwards be ſeen (art. 139.) is $\frac{25}{24}$.

Moreover, if, after having found the *ſol※* equal to $\frac{25}{16}$, we then tune by fifths and by fourths, *ſol※*, *re※*, *la※*, *mi※*, *ſi※*, as we have done with reſpect to the firſt ſeries of fifths, we find that the *ſi※* muſt be $\frac{2025}{2048}$; its difference, then, from unity, or, in other words, from UT, is $\frac{23}{2048}$, that is to ſay, about $\frac{1}{89}$; a comma ſtill leſs than any of the preceding, and which the Greeks have called *apotome minor.*

In a word, if, after having found *mi* equal to $\frac{5}{4}$ in the progreſſion of thirds, we then tune by fifths and fourths *mi*, *ſi*, *fa※*, *ut※*, &c. we ſhall arrive at a new *ſi※*, which ſhall be $\frac{32805}{32768}$, and which will not differ from unity but by about $\frac{1}{886}$, which is the laſt and ſmalleſt of all the commas; but it muſt be obſerved, that, in this caſe, the thirds major from *mi* to *ſol※*, from *ſol※* to *ſi※* or *ut*, &c. are extremely falſe, and greatly altered.

ſhould ſerve as limits to the other intervals, and that all the notes which riſe above or fall below the ordinary ſcale, are no more than replications, *i. e.* repetitions, of all that have gone before them. For this reaſon, if the octave were altered, there could be no longer any fixed point either in harmony or melody. It is then abſolutely neceſſary to tune the *ut* or *ſi※* in a juſt octave with the firſt; from whence it follows, that, in the progreſſion of fifths, or what is the ſame thing, in the alternate ſeries of fifths and fourths, UT, SOL, *re*, LA, *mi*, *ſi*, *fa※*, *ut※*, *ſol※*, *re※*, *la※*, *mi※*, *ſi※*, it is neceſſary that all the fifths ſhould be altered, or at leaſt ſome of them. Now, ſince there is no reaſon why one ſhould rather be altered than another, it follows, that we ought to alter them all equally. By theſe means, as the alteration is made to influence all the fifths, it will be in each of them almoſt imperceptible; and thus the fifth, which, after the octave, is the moſt perfect of all conſonances, and which we are under the neceſſity of altering, muſt only be altered in the leaſt degree poſſible.

67. It is true, that the thirds will be a little harſh: but as the interval of ſounds which conſtitutes the third, produces a leſs perfect coaleſcence than that of the fifth, it is neceſſary, ſays M. Rameau, to ſacrifice the juſtice of that chord to the perfection of the fifth; for the more perfect a chord is in its own nature, the more diſpleaſing to the ear is any alteration which can be made in it. In the octave the leaſt alteration is inſupportable.

151 Its definition.

68. This change in the intervals of inſtruments which have, or even which have not, keys, is that which we call *temperament*.

152 Principle whence its theory may be deduced.

69. It reſults then from all that we have now ſaid, that the theory of temperament may be reduced to this queſtion.—The alternate ſucceſſion of fifths and fourths having been given, UT, SOL, *re*, LA, *mi*, *ſi*, *fa※*, *ut※*, *ſol※*, *re※*, *la※*, *mi※*, *ſi※*, in which *ſi※* or *ut* is not the true octave of the firſt UT, it is propoſed to alter all the fifths equally, in ſuch a manner that the two *ut's* may be in a perfect octave the one to the other

153 Practical directions for temperament.

70. For a ſolution of this queſtion, we muſt begin with tuning the two *ut's* in a perfect octave the one to the other; in conſequence of which, we will render all the ſemitones which compoſe the octave as equal as poſſible. By this means (T) the alteration made in each fifth will be very conſiderable, but equal in all of them.

154 Rameau's method of temperament propoſed.

71. In this, then, the theory of temperament conſiſts: but as it would be difficult in practice to tune a harpſichord or organ by thus rendering all the ſemitones equal, M. Rameau, in his *Generation Harmonique*, has furniſhed us with the following method, to alter all the fifths as equally as poſſible.

72. Take any key of the harpſichord which you pleaſe; but let it be towards the middle of the inſtrument; for inſtance, UT: then tune the note SOL a fifth above it, at firſt with as much accuracy as poſſible; this you may imperceptibly diminiſh: tune afterwards the fifth to this with equal accuracy, and diminiſh it in the ſame manner; and thus proceed from one fifth to another

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(T) All the ſemitones being equal in the temperament propoſed by M. Rameau, it follows, that the twelve ſemitones *ut*, *ut※*, *re*, *re※*, *mi*, *mi※*, &c. ſhall form a continued geometrical progreſſion; that is to ſay, a ſeries in which *ut*, ſhall be to *ut※* in the ſame proportion as *ut※* to *re*, as *re* to *re※*, &c. and ſo of the reſt.

Theſe twelve ſemitones are formed by a ſeries of thirteen ſounds, of which *UT* and its octave *ut* are the firſt and laſt. Thus to find by computation the value of each ſound in the temperament, which is the preſent object of our ſpeculations, our ſcrutiny is limited to the inveſtigation of eleven other numbers between 1 and 2 which may form with the 1 and the 2 a continued geometrical progreſſion.

However little any one is practiſed in calculation, he will eaſily find each of theſe numbers, or at leaſt a number approaching to its value. Theſe are the characters by which they may be expreſſed, which mathematicians will eaſily underſtand, and which others may neglect.

UT	*ut※*	*re*	*re※*	*mi*	*fa*	*fa※*	*ſol*	*ſol※*
1	$\sqrt[12]{2}$	$\sqrt[12]{2^2}$	$\sqrt[12]{2^3}$	$\sqrt[12]{2^4}$	$\sqrt[12]{2^5}$	$\sqrt[12]{2^6}$	$\sqrt[12]{2^7}$	$\sqrt[12]{2^8}$
	la	*la※*	*ſi*	*ut*				
	$\sqrt[12]{2^9}$	$\sqrt[12]{2^{10}}$	$\sqrt[12]{}^{11}$	$\sqrt[12]{}^{12}$				

It is obvious, that in this temperament all the fifths are equally altered. One may likewiſe prove, that the alteration of each in particular is very inconſiderable; for it will be found, for inſtance, that the fifth from *ut* to *ſol*, which ſhould be $\frac{3}{2}$, ought to be diminiſhed by about $\frac{1}{12}$ of $\frac{1}{73}$; that is to ſay, by $\frac{1}{876}$, a quantity almoſt inconceivably ſmall.

It is true, that the thirds major will be a little more altered; for the third major from *ut* to *mi*, for inſtance, ſhall be increaſed in its interval by about $\frac{1}{126}$: but it is better, according to M. Rameau, that the alteration ſhould fall upon the third than upon the fifth, which after the octave is the moſt perfect chord, and from the perfection of which we ought never to degenerate but as little as poſſible.

Beſides, it has appeared from the ſeries of thirds major *ut*, *mi*, *ſol※*, *ſi※*, that this laſt *ſi※* is very different from *ut* (note s); from whence it follows, that if we would tune this *ſi※* in uniſon with the octave of *ut*, and alter at the ſame time each of the thirds major by a degree as ſmall as poſſible, they muſt all be equally altered. This is what occurred in the temperament which we propoſe; and if in it the third be more altered than the fifth, it is a conſequence of the difference which we find between the degrees of perfection in theſe intervals; a difference with which, if we may ſpeak ſo, the temperament propoſed conforms itſelf. Thus this diverſity of alteration is rather advantageous than inconvenient.

another in aſcent; and as the ear does not appreciate ſo exactly ſounds that are extremely ſharp, it is neceſſary, when by fifths you have riſen to notes extremely high, that you ſhould tune in the moſt perfect manner the octave below the laſt fifth which you had immediately formed; then you may continue always in the ſame manner; till in this proceſs you arrive at the laſt fifth from *mi*※ to *ſi*※, which ſhould of themſelves be in tune; that is to ſay, they ought to be in ſuch a ſtate, that *ſi*※, the higheſt note of the two which compoſe the fifth, may be identical with the ſound UT, with which you began, or at leaſt the octave of that ſound perfectly juſt: it will be neceſſary then to try if this UT, or its octave, forms a juſt fifth with the laſt ſound *mi*※ or *ſa* which has been already tuned. If this be the caſe, we may be certain that the harpſichord is properly tuned. But if this laſt fifth be not true, in this caſe it will be too ſharp, and it is an indication that the other fifths have been too much diminiſhed, or at leaſt ſome of them; or it will be too flat, and conſequently diſcover that they have not been ſufficiently diminiſhed. We muſt then begin and proceed as formerly, till we find the laſt fifth in tune of itſelf, and without our immediate interpoſition (υ).

By

(υ) All that remains, is to acknowledge, with M. Rameau, that this temperament is far remote from that which is now in practice: you may here ſee in what this laſt temperament conſiſts as applied to the organ or harpſichord. They begin with *UT* in the middle of the keys, and they flatten the four firſt fifths *ſol*, *re*, *la*, *mi*, till they form a true third major from *mi* to *ut*; afterwards, ſetting out from this *mi*, they tune the fifths *ſi*, *fa*※, *ut*※, *ſol*※, but flattening them ſtill leſs than the former, ſo that *ſol*※ may almoſt form a true third major with *mi*. When they have arrived at *ſol*※, they ſtop; they reſume the firſt *ut*, and tune to it the fifth *fa* in deſcending, then the fifth *ſi*♭, &c. and they heighten a little all the fifths till they have arrived at *la*♭, which ought to be the ſame with the *ſol*※ already tuned.

If, in the temperament commonly practiſed, ſome thirds are found to be leſs altered than in that preſcribed by M. Rameau, in return, the fifths in the firſt temperament are much more falſe, and many thirds are likewiſe ſo; inſomuch, that upon a harpſichord tuned according to the temperament in common uſe, there are five or ſix modes which the ear cannot endure, and in which it is impoſſible to execute any thing. On the contrary, in the temperament ſuggeſted by M. Rameau, all the modes are equally perfect; which is a new argument in its favour, ſince the temperament is peculiarly neceſſary in paſſing from one mode to another, without ſhocking the ear; for inſtance, from the mode of *ut* to that of *ſol*, from the mode of *ſol* to that of *re*, &c. It is true, that this uniformity of modulation will to the greateſt number of muſicians appear a defect: for they imagine, that, by tuning the ſemitones of the ſcale unequal, they give each of the modes a peculiar character; ſo that, according to them, the ſcale of *ut*,

ut, *re*, *mi*, *fa*, *ſol*, *la*, *ſi*, *UT*,

is not perfectly ſimilar to the gammut or diatonic ſcale of the mode of *mi*

mi, *fa*※, *ſol*※, *la*※, *ſi*, *ut*※, *re*※, *mi*,

which, in their judgment, renders the modes of *ut* and *mi* proper for different manners of expreſſion. But after all that we have ſaid in this treatiſe on the formation of diatonic intervals, every one ſhould be convinced, that, according to the intention of nature, the diatonic ſcale ought to be perfectly the ſame in all its modes: The contrary opinion, ſays M. Rameau, is a mere prejudice of muſicians. The character of an air ariſes chiefly from the intermixture of the modes; from the greater or leſſer degrees of vivacity in the movement; from the tones, more or leſs grave, or more or leſs acute, which are aſſigned to the generator of the mode: and from the chords more or leſs beautiful, as they are more or leſs deep, more or leſs flat, more or leſs ſharp, which are found in it.

In ſhort, the laſt advantage of this temperament is, that it will be found conformed, or at leaſt very little different from that which they practice upon inſtruments without keys; as the baſs-viol, the violin, in which true fifths and fourths are preferred to thirds and ſixths tuned with equal accuracy; a temperament which appears incompatible with that commonly uſed in tuning the harpſichord.

Yet we muſt not ſuffer our readers to be ignorant, that M. Rameau, in his *New Syſtem of Muſic*, printed in 1726, had adopted the ordinary temperament. In that work, (as may be ſeen Chap. XXIV.), he pretends that the alteration of the fifths is much more ſupportable than that of the thirds major; and that this laſt interval can hardly ſuffer a greater alteration than the octave, which, as we know, cannot ſuffer the ſmalleſt alteration. He ſays, that if three ſtrings are tuned, one by an octave, the other by a fifth, and the next by a third major to a fourth ſtring, and if a ſound be produced from the laſt, the ſtrings tuned by a fifth will vibrate, though a little leſs true than it ought to have been; but that the octave and the third major, if altered in the leaſt degree, will not vibrate: and he adds, that the temperament which is now practiſed, is founded upon that principle. M. Rameau goes ſtill farther; and as, in the ordinary temperament, there is a neceſſity for altering the laſt third major, and to make them a little more ſharp, that they may naturally return to the octave of the principal ſound, he pretends that this alteration is tolerable, not only becauſe it is almoſt inſenſible, but becauſe it is found in modulations not much in uſe, unleſs the compoſer ſhould chooſe it on purpoſe to render the expreſſion ſtronger. "For it is proper to remark (ſays he), that we receive different impreſſions from the intervals in proportion to their different alterations: for inſtance, the third major, which naturally elevates us to joy, in proportion as we feel it, heightens our feelings even to a kind of fury, when it is tuned too ſharp; and the third minor, which naturally inſpires us with tenderneſs and ſerenity, depreſſes us to melancholy when it is too flat." All this ſtrain, as you may ſee, is immenſely different from that which this celebrated muſician afterwards

By this method all the twelve ſounds which compoſe one of the ſcales ſhall be tuned: nothing is neceſſary but to tune with the greateſt poſſible exactneſs their octaves in the other ſcale, and the harpſichord ſhall be well tuned.

155
Alterations by either method hardly diſagreeable.

We have given this rule for temperament from M. Rameau; and it belongs only to diſintereſted artiſts to judge of it. However this queſtion be determined, and whatever kind of temperament may be received, the alterations which it produces in harmony will be but very ſmall, or not perceptible to the ear, whoſe attention is entirely engroſſed in attuning itſelf with the fundamental baſs, and which ſuffers, without uneaſineſs, theſe alterations, or rather takes no notice of them, becauſe it ſupplies from itſelf what may be wanting to the truth and perfection of the intervals.

Simple and daily experiments confirm what we now advance. Liſten to a voice which is accompanied, in ſinging, by different inſtruments; though the temperament of the voice, and the temperament of each of the inſtruments, are all different one from another, yet you will not be in the leaſt affected with the kind of cacophony which ought to reſult from theſe diverſities, becauſe the ear ſuppoſes theſe intervals true of which it does not appreciate differences.

We may give another experiment. Strike upon an organ the three keys *mi*, *ſol*, *ſi*, you will hear nothing but the minor perfect chord; though *mi*, by the conſtruction of that inſtrument, muſt cauſe *ſol*※ likewiſe to be heard; though *ſol* ſhould have the ſame effect upon *re*, and *ſi* upon *fa*※; inſomuch, that the ear is at once affected with all theſe ſounds, *re*, *mi*, *fa*※, *ſol*, *ſol*※, *ſi*: how many diſſonances perceived at the ſame time, and what a jarring multitude of diſcordant ſenſations, would reſult from thence to the ear, if the perfect chord with which it is pre-occupied had not power entirely to abſtract its attention from ſuch ſounds as might offend!

Chap. VIII. *Of Repoſes or Cadences* (†).

156
Cadences perfect and imperfect, what and why.

73. In a fundamental baſs whoſe procedure is by fifths, there always is, or always may be, a *repoſe*, or criſis, in which the mind acquieſces in its tranſition from one ſound to another: but a repoſe may be more or leſs diſtinctly ſignified, and of conſequence more or leſs perfect. If one ſhould riſe by fifths; if, for inſtance, we paſs from *ut* to *ſol*; it is the generator which paſſes to one of theſe fifths, and this fifth was already pre-exiſtent in its generator: but the generator exiſts no longer in this fifth; and the ear, as this generator is the principle of all harmony and of all melody, feels a deſire to return to it. Thus the tranſition from a ſound to its fifth in aſcent, is termed an *imperfect repoſe*, or *imperfect cadence*; but the tranſition from any ſound to its fifth in deſcent, is denominated a *perfect cadence*, or an *abſolute repoſe*: it is the offspring which returns to its generator, and as it were recovers its exiſtence once more in that generator itſelf, with which when ſounding it reſounds (chap. i.)

See Repoſe or Cadence.

157
Perfect cadences more or leſs perfect, and why.

74. Amongſt abſolute repoſes, there are ſome, if we may be allowed the expreſſion, more abſolute, that is to ſay, more perfect, than others. Thus in the fundamental baſs

ut, *ſol*, *ut*, *fa*, *ut*, *ſol*, *re*, *ſol*, *ut*,

which forms, as we have ſeen, the diatonic ſcale of the moderns, there is an abſolute repoſe from *re* to *ſol*, as from *ſol* to *ut*: yet this laſt abſolute repoſe is more perfect than the preceding, becauſe the ear, prepoſſeſſed with the mode of *ut* by the multiplied impreſſion of the ſound *ut* which it has already heard thrice before, feels a deſire to return to the generator *ut*; and it accordingly does ſo by the abſolute repoſe *ſol*, *ut*.

158
Cadence in melody different from what it is in harmony.

75. We may ſtill add, that what is commonly called *cadence* in melody, ought not to be confounded with what we name *cadence* in harmony.

In the firſt caſe, this word only ſignifies an agreeable and rapid alteration between two contiguous ſounds, called likewiſe a *trill* or *ſhake*; in the ſecond, it ſignifies a repoſe or cloſe. It is however true, that this ſhake implies, or at leaſt frequently enough preſages, a repoſe, either preſent or impending, in the fundamental baſs (x).

159
Cadences in the fundamental baſs neceſſary in the diatonic ſcale, and which the moſt perfect.

76. Since there is a repoſe in paſſing from one ſound to another in the fundamental baſs, there is alſo a repoſe in paſſing from one note to another in the diatonic ſcale, which is formed from it, and which this baſs repreſents: and as the abſolute repoſe *ſol ut*, is

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terwards exhibited in his *Generation Harmonique*, and in the performances which followed it. From this we can only conclude, that the reaſons which, after him, we have urged for the new temperament, muſt without doubt have appeared to him very ſtrong, becauſe in his mind they had ſuperſeded thoſe which he had formerly adduced in favour of the ordinary temperament.

We do not pretend to give any deciſion for either the one or the other of theſe methods of temperament, each of which appears to us to have its particular advantages. We ſhall only remark, that the choice of the one or the other muſt be left abſolutely to the taſte and inclination of the reader; without, however, admitting this choice to have any influence upon the principles of the ſyſtem of muſic, which we have followed even till this period, and which muſt always ſubſiſt, whatever temperament we adopt.

(†) That the reader may have a clear idea of the term before he enters upon the ſubject of this chapter, it may be neceſſary to caution him againſt a miſtake into which he may be too eaſily led by the ordinary ſignification of the word *repoſe*. In muſic, therefore, it is far from being ſynonymous with the word *reſt*. It is, on the contrary, the termination of a muſical *phraſe* which ends in a cadence more or leſs emphatic, as the ſentiment implied in the phraſe is more or leſs complete. Thus a repoſe in muſic anſwers the ſame purpoſe as punctuation in language. See Repos in Rouſſeau's Muſical Dictionary.

(x) M. Rouſſeau, in his letter on French muſic, has called this alternate undulation of different ſounds a *trill*, from the Italian word *trillo*, which ſignifies the ſame thing; and ſome French muſicians already appear to have adopted this expreſſion.

of all others the moſt perfect in the fundamental baſs, the repoſe from *ſi* to *ut*, which anſwers to it in the ſcale, and which is likewiſe terminated by the generater, is for that reaſon the moſt perfect of all others in the diatonic ſcale aſcending.

160 Definition and uſe of a ſenſible note.

77. It is then a law dictated by nature itſelf, that if you would aſcend diatonically to the generator of a mode, you can only do this by means of the third major from the fifth of that very generator. This third major, which with the generator forms a ſemitone, has for that reaſon been called the *ſenſible note*, as introducing the generator, and preparing us for the moſt perfect repoſe.

See Senſible note.

We have already proved, that the fundamental baſs is the principle of melody. We ſhall beſides make it appear in the ſequel, that the effect of a repoſe in melody ariſes ſolely from the fundamental baſs.

CHAP. IX. *Of the Minor Mode and its Diatonic Series.*

161 The diatonic ſeries of the minor mode aſcertained by different examples.

78. IN the ſecond chapter, we have explained (art. 29. 30. 31. and 32.) by what means, and upon what principle, the minor chord *ut, mi*♭, *ſol, ut*, may be formed, which is the characteriſtical chord of the minor mode. Now what we have there ſaid, taking *ut* for the principal and fundamental ſound, we might likewiſe have ſaid of any other note in the ſcale, aſſumed in the ſame manner as the principal and fundamental ſound: but as in the minor chord *ut, mi*♭, *ſol, ut*, there occurs a *mi*♭ which is not found in the ordinary diatonic ſcale, we ſhall immediately ſubſtitute, for greater eaſe and conveniency, another chord, which is likewiſe minor and exactly ſimilar to the former, of which all the notes are found in the ſcale.

79. The ſcale affords us three chords of this kind, viz. *re, fa, la, re*; *la, ut, mi, la*; and *mi, ſol, ſi, mi*. Amongſt theſe three we ſhall chooſe *la, ut, mi, la*; becauſe this chord, without including any ſharp or flat, has two ſounds in common with the major chord *ut, mi, ſol, ut*; and beſides, one of theſe two ſounds is the very ſame *ut*: ſo that this chord appears to have the moſt immediate, and at the ſame time the moſt ſimple, relation with the chord *ut, mi, ſol, ut*. Concerning this we need only add, that this preference of the chord *la, ut, mi, la*, to every other minor chord, is by no means in itſelf neceſſary for what we have to ſay in this chapter upon the diatonic ſcale of the minor mode. We might in the ſame manner have choſen any other minor chord; and it is only, as we have ſaid, for greater eaſe and conveniency that we fix upon this.

162 Tonic or key in harmony, what. See Principal. See Tonic.

80. Let us now remark, that in every mode, whether major or minor, the *principal* ſound which implies the perfect chord, whether major or minor, may be called the *tonic note* or *key*; thus *ut* is the key in its proper mode, *la* in the mode of *la*, &c. Having laid down this principle.

163 The formation of the ſcale purſued. See fig. D.

81. We have ſhown how the three ſounds *fa, ut, ſol*, which conſtitute (art. 38.) the mode of *ut*, of which the firſt *fa* and the laſt *ſol* are the two fifths of *ut*, one deſcending, the other riſing, produce the ſcale *ſi, ut, re, mi, fa, ſol, la*, of the major mode, by means of the fundamental baſs *ſol, ut, ſol, ut, fa, ut, fa*: let us in the ſame manner take the three ſounds *re, la, mi*, which conſtitute the mode of *la*, for the ſame reaſon that the ſounds *fa, ut, ſol*, conſtitute the mode of *ut*; and of them let us form this fundamental baſs, perfectly like the preceding, *mi, la, mi, la, re, la, re*: let us afterwards place below each of theſe ſounds one of their harmonics, as we have done (chap. v.) for the firſt ſcale of the major mode; with this difference, that we muſt ſuppoſe *re* and *la* as implying their thirds minor in the fundamental baſs to characteriſe the minor mode; and we ſhall have the diatonic ſcale of that mode,

See fig. E.

ſol※, *la, ſi, ut, re, mi, fa.*

82. The *ſol*※, which correſponds with *mi* in the fundamental baſs, forms a third major with that *mi*, though the mode be minor; for the ſame reaſon that a third from the fifth of the fundamental ſound ought to be major (art. 77.) when that third riſes to the fundamental ſound *la*.

83. It is true, that, in cauſing *mi* to imply its third major *ſol*, one might alſo riſe to *la* by a diatonic progreſs. But that manner of riſing to *la* would be leſs perfect than the preceding; for this reaſon (art. 76.), that the abſolute repoſe or perfect cadence, *mi, la*, which is found in the fundamental baſs, ought to be repreſented in the moſt perfect manner in the two notes of the diatonic ſcale which anſwer to it, eſpecially when one of theſe two notes is *la*, the key itſelf upon which the repoſe is made. From whence it follows, that the preceding note *ſol* ought rather to be ſharp than natural; becauſe *ſol*※, being included in *mi* (art. 19.), much more perfectly repreſents the note *mi* in the baſs, than the natural *ſol* could do, which is not included in *mi*.

See Imply or Carry.

164 Diverſities in the ſcales of the major and minor mode.

84. We may remark this firſt difference between the ſcale

ſol※, *la, ſi, ut, re, mi, fa*,

and the ſcale which correſponds with it in the major mode

ſi, ut, re, mi, fa, ſol, la,

that from *mi* to *fa*, which are the two laſt notes of the former ſcale, there is only a ſemitone; whereas from *ſol*, to *la*, which are the two laſt ſounds of the latter ſeries, there is the interval of a complete tone: but this is not the only diſcrimination which may be found between the ſcales of the two modes.

165 Inveſtigation of theſe differences and their reaſons. See fig. F.

85. To inveſtigate theſe differences, and to diſcover the reaſon for which they happen, we ſhall begin by forming a new diatonic ſcale of the minor mode, ſimilar to the ſecond ſcale of the major mode,

ut, re, mi, fa, ſol, ſol, la, ſi, ut.

That laſt ſeries, as we have ſeen, was formed by means of the fundamental baſs *fa, ut, ſol, re*, diſpoſed in this manner,

ut, ſol, ut, fa, ut, ſol, re, ſol, ut.

Let us take in the ſame manner the fundamental baſs *re la mi ſi*, and arrange it in the following order,

la, mi, la, re, la, mi, ſi, mi, la,

See fig. H.

and it will produce the ſcale immediately ſubjoined,

la, ſi, ut, re, mi, mi, fa※, *ſol*※, *la*,

in which *ut* forms a third minor with *la*, which in the fundamental baſs correſponds with it, which denominates the minor mode; and, on the contrary, *ſol*※ forms a third major with *mi* in the fundamental baſs, becauſe *ſol*※ riſes towards *la*, (art. 82. and 83.)

86.

86. We ſee beſides a *fa*※, which does not occur in the former,

ſol※, *la*, *ſi*, *ut*, *re*, *mi*, *fa*,

where *fa* is natural. It is becauſe, in the firſt ſcale, *fa* is a third minor from *re* in the baſs; and in the ſecond, *fa*※ is the fifth from *ſi* in the baſs.

166 Difference between the two ſcales of the minor mode greater than between thoſe of the major.

87. Thus the two ſcales of the minor mode are ſtill in this reſpect more different one from the other than the two ſcales of the major mode; for we do not remark this difference of a ſemitone between the two ſcales of the major mode. We have only obſerved (art. 63.) ſome difference in the value of *la* as it ſtands in each of theſe ſcales, but this amounts to much leſs than a ſemitone.

167 Fa and ſol ſharp in the minor mode, and why.

88. From thence it may be ſeen why *fa* and *ſol* are ſharp when aſcending in the minor mode; nay, beſides, the *fa* is only natural in the firſt ſcale *ſol*※, *la*, *ſi*, *ut*, *re*, *mi*, *fa*, becauſe this *fa* cannot riſe to *ſol*※, (art. 48.)

168 The caſe different in deſcending, and why.

89. It is not the ſame caſe in deſcending. For *mi*, the fifth of the generator, ought not to imply the third major *ſol*※, but in the caſe when that *mi* deſcends to the generator *la* to form a perfect repoſe (art. 77. and 83.); and in this caſe the third major *ſol*※ riſes to the generator *la*: but the fundamental baſs *la mi* may, in deſcending, give the ſcale *la ſol* natural, provided *ſol* does not riſe towards *la*.

169 Explication of the deſcending ſcale in the minor mode from a fundamental baſs difficult.

90. It is much more difficult to explain how the *fa*, which ought to follow this *ſol* in deſcending, is natural and not ſharp; for the fundamental baſs

la, *mi*, *ſi*, *mi*, *la*, *re*, *la*, *mi*, *la*,

produces in deſcending,

la, *ſol*, *fa*※, *mi*, *mi*, *re*, *ut*, *ſi*, *la*.

And it is plain that the *fa* cannot be otherwiſe than ſharp, ſince *fa*※ is the fifth of the note *ſi* of the fundamental baſs. In the mean time, experience evinces that the *fa* is natural in deſcending in the diatonic ſcale of the major mode of *la*, eſpecially when the preceding *ſol* is natural: and it muſt be acknowledged, that here the fundamental baſs appears in ſome meaſure defective.

170 Rameau's ſolution, though the only one, yet unſatisfactory.

M. Rameau has invented the following means for obtaining a ſolution of this difficulty. According to him, in the diatonic ſcale of the minor mode in deſcending, *la*, *ſol*, *fa*, *mi*, *re*, *ut*, *ſi*, *la*, *ſol*, may be regarded ſimply as a note of paſſage, merely added to give ſweetneſs to the modulation, and as a diatonic gradation by which we may deſcend to *fa* natural. It is eaſily perceived, according to M. Rameau, by this fundamental baſs,

la, *re*, *la*, *re*, *la*, *mi*, *la*,

which produces

la, *fa*, *mi*, *re*, *ut*, *ſi*, *la*;

which may be regarded, as he ſays, as the real ſcale of the minor mode in deſcending; to which is added *ſol* natural between *la* and *fa*, to preſerve the diatonic order.

This anſwer appears the only one which can be given to the difficulty above propoſed: but I know not whether it will fully ſatisfy the reader; whether he will not ſee with regret, that the fundamental baſs does not produce, to ſpeak properly, the diatonic ſcale of the minor mode in deſcent, when at the ſame time this ſame baſs ſo happily produces the diatonic ſcale of that identical mode in aſcending, and the diatonic ſcale of the major mode whether in riſing or deſcending (y).

Chap. X. *Of Relative Modes.*

171 Modes relative, what. See Mode.

91. Two modes which are of ſuch a nature that we can paſs from the one to the other, are called *relative modes*. Thus we have already ſeen, that the major mode of *ut* is relative to the major mode of *fa* and to that of *ſol*. It may likewiſe appear from what goes before, how many intimate connections there are between the *ſpecies* (†) or major mode of *ut*, and the *ſpecies* or minor mode of *la*. For, 1. The perfect chords, one major *ut mi ſol ut*, the other minor *la ut mi la*, which characteriſe each of thoſe two kinds of modulation * or harmony, have two ſounds in common, *ut* or *mi*. 2. The diatonic ſcale of the minor mode of *la* in deſcent, abſolutely contains the ſame ſounds with the gammut or diatonic ſcale of the major mode of *ut*.

* See Modulation.

It is for this reaſon that the tranſition is ſo natural and eaſy from the major mode of *ut* to the minor mode of *la*, or from the minor mode of *la* to the major mode of *ut*, as experience proves.

92. In the minor mode of *mi*, the minor perfect chord *mi ſol ſi mi*, which characteriſes it, has likewiſe two ſounds, *mi*, *ſol*, in common with the perfect chord major *ut mi ſol ut*, which characteriſes the major mode of *ut*. But the minor mode of *mi* is not ſo cloſely related nor allied to the major mode of *ut* as to the minor mode of *la*; becauſe the diatonic ſcale of the minor mode of *mi* in deſcent, has not, like the ſeries of

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(y) For what remains when *ſol* is ſaid to be natural in deſcending the diatonic ſcale of the minor mode of *la*, this only ſignifies, that this *ſol* is not neceſſarily ſharp in deſcending as it is in riſing; for this *ſol*, beſides, may be ſharp in deſcending to the minor mode of *la*, as may be proved by numberleſs examples, of which all muſical compoſitions are full. It is true, that when the ſound *ſol* is found ſharp in deſcending to the minor mode of *la*, ſtill we are not ſure that the mode is minor till the *fa* or *ut* natural is found; both of which impreſs a peculiar character on the minor mode, viz. *ut* natural, in riſing and deſcending, and the *fa* natural in deſcending.

(†) *Species* was the only word which occurred to the tranſlator in Engliſh by which he could render the French word *genre*. It is, according to Rouſſeau, intended to expreſs the different diviſions and diſpoſitions of the intervals which formed the two tetrachords in the ancient diatonic ſcale; and as the gammut of the moderns conſiſts likewiſe of two tetrachords, though diverſified from the former, as our author has ſhown at large, the *genre* or *ſpecies*, as the tranſlator has been obliged to expreſs it, muſt conſiſt in the various diſpoſitions and diviſions of the different intervals between the notes or ſemitones which compoſe the modern ſcale.

the minor mode of *la*, all theſe ſounds in common with the ſcale of *ut*. In reality, this ſcale is *mi re ut ſi la ſol fa ※ mi*, where there occurs a *fa* ſharp which is not in the ſcale of *ut*. We may add, that though the minor mode of *mi* is leſs relative to the major mode of *ut* than that of *la*; yet the artiſt does not heſitate ſometimes to paſs immediately from the one to the other.

Of this may be ſeen one inſtance (among many others) in the prologue *des Amours, des Dieux*, at this paſſage *Ovide eſt l'objet de la fete*, which is in the minor mode of *mi*, though what immediately precedes it is in the major mode of *ut*.

We may ſee beſides, that when we paſs from one mode to another by the interval of a third, whether in deſcending or riſing, as from *ut* to *la*, or from *la* to *ut*, from *ut* to *mi*, or from *mi* to *ut*, the major mode becomes minor, or the minor mode becomes major.

93. There is ſtill another minor mode, into which an immediate tranſition may be made in iſſuing from the major mode of *ut*. It is the minor mode of *ut* itſelf in which the perfect minor chord *ut mi*♭ *ſol ut* has two ſounds, *ut* and *ſol*, in common with the perfect major chord *ut mi ſol ut*. Nor is there any thing more common than a tranſition from the major mode of *ut* to the minor mode, or from the minor to the major (z.)

Chap. IX. *Of Diſſonance.*

172 Caſes in which the mode is uncertain.

94. We have already obſerved, that the mode of *ut* (*fa, ut, ſol*), has two ſounds in common with the mode of *ſol* (*ut, ſol, re*); and two ſounds in common with the mode of *fa* (*ſi*♭ *fa ut*); of conſequence, this procedure of the baſs *ut ſol* may belong to the mode of *ut*, or to the mode of *ſol*, as the procedure of the baſs *fa ut*, or *ut fa*, may belong to the mode of *ut* or the mode of *fa*. When any one therefore paſſes from *ut* to *fa* or to *ſol* in a fundamental baſs, he is ſtill ignorant even to that criſis what mode he is in. It would be, however, advantageous to know it, and to be able by ſome means to diſtinguiſh the generator from its fifths.

173 How we may inveſtigate the generator and its fifths, and by that means determine the mode.

95. This advantage may be obtained by uniting at the ſame time the ſounds *ſol* and *fa* in the ſame harmony, that is to ſay by joining to the harmony *ſol ſi re* of the fifth *ſol*, the other fifth *fa* in this manner, *ſol, ſi, re, fa*; this *fa* which is added, forms a diſſonance with *ſol* (art. 18.) It is for that reaſon that the chord *ſol ſi re fa*, is called a *diſſonant* chord, or a chord of the ſeventh. It ſerves to diſtinguiſh the fifth *ſol* from the generator *ut*, which always implies, without mixture or alteration, the perfect chord *ut, mi, ſol, ut*, reſulting from nature itſelf (art. 32.) By this we may ſee, that when we paſs from *ut* to *ſol*, one paſſes at the ſame time from *ut* to *fa*, becauſe *fa* is found to be comprehended in the chord of *ſol*; and the mode of *ut* by theſe means plainly appears to be determined, becauſe there is none but that mode to which the ſounds *fa* and *ſol* at once belong.

174 Manner of treating diſſonances continued.

96. Let us now ſee what may be added to the harmony *fa, la, ut*, of the fifth *fa* below the generator, to diſtinguiſh this harmony from that of the generator. It ſeems probable at firſt, that we ſhould add to it the other fifth *ſol*, ſo that the generator *ut*, in paſſing to *fa*, may at the ſame time paſs to *ſol*, and that by this the mode ſhould be determined: but this introduction of *ſol*, in the chord *fa, la, ut*, would produce two ſeconds in ſucceſſion *fa, ſol, ſol, la*, that is to ſay, two diſſonances whoſe union would prove extremely harſh to the ear; an inconvenience which ought carefully to be avoided. For if, to diſtinguiſh the mode, we ſhould alter the harmony of the fifth *fa* in the fundamental baſs, it muſt only be altered in the leaſt degree poſſible.

175 Chord of the great ſixth.

97. For this reaſon, inſtead of *ſol*, we ſhall take its fifth *re*, which is the ſound that approaches it the neareſt; and we ſhall have, inſtead of the fifth *fa*, the chord *fa, la, ut, re*, which is called a *chord of the great ſixth*.

One may here remark the analogy there is obſerved between the harmony of the fifth *ſol* and that of the fifth *fa*.

176 The ſubject of diſſonances continued.

98. The fifth *ſol*, in riſing above the generator, gives a chord entirely conſiſting of thirds aſcending from *ſol*, *ſol, ſi, re, fa*; now the fifth *fa* being below the generator *ut* in deſcending, we ſhall find, as we go lower by thirds from *ut* towards *fa*, the ſame ſounds *ut, la, fa, re*, which form the chord *fa, la, ut, re*, given to the fifth *fa*.

99. It appears beſides, that the alteration of the harmony in the two fifths conſiſts only in the third minor *re, fa*, which was reciprocally added to the harmony of theſe two fifths.

Chap. XII. *Of the Double Uſe or Employment of Diſſonance.*

177 Account of the double employment.

100. It is evident by the reſemblance of ſounds to their octaves, that the chord *fa, la, ut, re*, is in effect the ſame as the chord *re, fa, la, ut*, taken inverſely*, that the inverſe of the chord *ut, la, fa, re*, has been found

* See Inverted.

(z) There are likewiſe other minor modes, into which we may paſs in our egreſs from the mode major of *ut*; as that of *fa* minor, in which the perfect minor chord *fa, la*♭, *ut*, includes the ſound *ut*, and whoſe ſcale in aſcent *fa, ſol, la*♭, *ſi*♭, *ut, re, mi, fa*, only includes the two ſounds *la*♭, *ſi*♭, which do not occur in the ſcale of *ut*. We find an example of this tranſition from the mode major of *ut* to that of *fa* minor, in the opera of *Pygmalion* by M. Rameau, where the *ſarabando* is in the minor mode of *fa*, and the *rigadoon* in the mode major of *ut*. This kind of tranſition, however, is not frequent.

The minor mode of *re* has only in its ſcale aſcending *re, mi, fa, ſol, la, ſi, ut ※, re*, one *ut* ſharp which is not found in the ſcale of *ut*. For this reaſon a tranſition may likewiſe be made, without grating the ear, from the mode of *ut* major to the mode of *re* minor; but this paſſage is leſs immediate than the former, becauſe the chords *ut, mi, ſol, ut, re, fa, la, re*, not having a ſingle ſound in common, one cannot (art. 37.) paſs immediately from the one to the other.

ſound (art. 98.) in deſcending by thirds from the generator *ut* (AA).

178 Difference between dominant and tonic dominant

101. The chord *re, fa, la, ut,* is a chord of the ſeventh like the chord *ſol, ſi, re, fa:* with this only difference, that in this the third *ſol, ſi,* is major: whereas in the ſecond, the third *re, fa,* is minor. If the *fa* were ſharp, the chord *re, fa✻, la, ut,* would be a genuine chord of the dominant, like the chord *ſol, ſi, re, fa;* and as the dominant *ſol* may deſcend to *ut* in the fundamental baſs, the dominant *re* implying or carrying with it the third major *fa✻* might in the ſame manner deſcend to *ſol.*

102. Now I ſay that if the *fa✻* ſhould be changed into *fa* natural, *re,* the fundamental tone of this chord *re, fa, la, ut,* might ſtill deſcend to *ſol;* for the change from *fa✻* to *fa* natural, will have no other effect, than to preſerve the impreſſion of the mode of *ut,* inſtead of that of the mode of *ſol,* which the *fa✻* would have here introduced. For what remains, the note *re* will always preſerve its character as the dominant, on account of the mode of *ut,* which forms a ſeventh. Thus in the chord of which we treat, *re, fa, la, ut, re,* may be conſidered as an *imperfect dominant:* I call it *imperfect,* becauſe it carries with it the third minor *fa,* inſtead of the third major *fa✻*. It is for this reaſon that in the ſequel I ſhall call it ſimply the *dominant,* to diſtinguiſh it from the dominant *ſol,* which ſhall be named the *tonic dominant* †.

† See Dominant.

103. Thus the ſounds *fa* and *ſol,* which cannot ſucceed each other (art. 37.) in a diatonic baſs, when they only carry with them the perfect chords *fa, la, ut, ſol, ſi, re,* may ſucceed one another if you join *re* to the harmony of the firſt, and *fa* to the harmony of the ſecond; and if you invert the firſt chord, that is to ſay, if you give to the two chords this form *re, fa, la, ut, ſol, ſi, re, fa.*

179 Seeming contradictions reconciled.

104. Beſides, the chord *fa, la, ut, re,* being allowed to ſucceed the perfect chord *ut, mi, ſol, ut,* it follows for the ſame reaſons, that the chord *ut, mi, ſol, ut,* may be ſucceeded by *re, fa, la, ut;* which is not contradictory to what we have above ſaid (art. 37.), that the ſounds *ut* and *re* cannot ſucceed one another in the fundamental baſs: for in the paſſage quoted, we had ſuppoſed that both *ut* and *re* carried with them a perfect chord major; whereas, in the preſent caſe, *re* carries the third minor *fa,* and likewiſe the ſound *ut,* by which the chord *re fa la ut* is connected with that which precedes it *ut mi ſol ut;* and in which the ſound *ut* is found. Beſides, this chord, *re fa la ut,* is properly nothing elſe but the chord *fa la ut re* inverted, and if we may ſpeak ſo, diſguiſed.

180 Double employment, what, and why ſo called.

105. This manner of preſenting the chord of the ſub-dominant under two different forms, and of employing it under theſe two different forms, has been called by M. Rameau its *double office* or *employment* †. This is the ſource of one of the fineſt varieties in harmony; and we ſhall ſee in the following chapter the advantages which reſult from it.

† See Double employment.

We may add, that as this double employment is a kind of licence, it ought not to be practiſed without ſome precaution. We have lately ſeen that the chord *re fa la ut,* conſidered as the inverſe of *fa la ut re,* may ſucceed to *ut mi ſol ut,* but this liberty is not reciprocal: and though the chord *fa la ut re* may be followed by the chord *ut mi ſol ut,* we have no right to conclude from thence that the chord *re fa la ut,* conſidered as the inverſe of *fa la ut re,* may be followed by the chord *ut mi ſol ut.* For this the reaſon ſhall be given CHAP. XVI.

CHAP. XIII. *Concerning the Uſe of this Double Employment, and its Rules.*

181 By the double uſe of the abovementioned chord, the impreſſion of the mode may be preſerved.

106. WE have ſhown (chap. vi.) how the diatonic ſcale, or ordinary gammut, may be formed from the fundamental baſs *fa, ut, ſol, re,* by twice repeating the word *ſol* in that ſeries; ſo that this gammut is primitively and originally compoſed of two ſimilar tetrachords, one in the mode of *ut,* the other in that of *ſol.* Now it is poſſible, by means of this double employment, to preſerve the impreſſion of the mode of *ut* through the whole extent of the ſcale, without twice repeating the note *ſol,* or even without ſuppoſing this repetition. For this effect we have nothing to do but form the following fundamental baſs,

ut, ſol, ut, fa, ut, re, ſol, ut:

in which *ut* is underſtood to carry with it the perfect chord *ut mi ſol ut; ſol,* the chord *ſol ſi re fa; fa,* the chord

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(AA) "M. Rameau, in ſeveral paſſages of his works (for inſtance, in p. 110, 111, 112, and 113, of the *Generation Harmonique),* appears to conſider the chord *re, fa, la, ut,* as the primary chord and generator of the chord *fa, la, ut, re,* which is nothing but that chord itſelf reverſed; in other paſſages (particularly in p. 116. of the ſame performance), he ſeems to conſider the firſt of theſe chords as nothing elſe but the reverſe of the ſecond. It would ſeem that this great artiſt has neither expreſſed himſelf upon this ſubject with ſo much uniformity nor with ſo much preciſion as is required. For my own part, I think there is ſome foundation for conſidering the chord *fa, la, ut, re,* as primitive: 1. Becauſe in this chord, the fundamental and principal note is the ſub-dominant *fa,* which ought in effect to be the fundamental and principal ſound in the chord of the ſub-dominant. 2. Becauſe that without having recourſe, with M. Rameau, to harmonical and arithmetical progreſſions, of which the conſideration appears to us quite foreign to the queſtion, we have found a probable and even a ſatisfactory reaſon for adding the note *re* to the harmony of the fifth *fa* (art. 96. and 97.) The origin thus aſſigned for the chord of the ſub-dominant appears to us the moſt natural, though M. Rameau does not appear to have felt its full value; for ſcarcely has it been ſlightly inſinuated by him."

Thus far our author. We do not enter with him into the controverſy concerning the origin of the chord in queſtion; but only propoſe to add to his definition of the ſub-dominant Rouſſeau's idea of the ſame note. It is a name, ſays he, given by M. Rameau to the fourth note in any modulation relative to a given key, which of conſequence is in the ſame interval from the key in deſcending as the dominant in riſing; from which circumſtance it takes its name.

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chord *fa la ut re*; and *re*, the chord *re fa la ut*. It is plain from what has been ſaid in the preceding chapter, that in this caſe *ut* may aſcend to *re* in the fundamental baſs, and *re* deſcend to *ſol*, and that the impreſſion of the mode of *ut* is preſerved by the *fa* natural, which forms the third minor *re fa*, inſtead of the third major which *re* ought naturally to imply.

107. This fundamental baſs will give, as it is evident, the ordinary diatonic ſcale,

ut, re, mi, fa, ſol, la, ſi, UT,

which of conſequence will be in the mode of *ut* alone; and if one ſhould chooſe to have the ſecond tetrachord in the mode of *ſol*, it will be neceſſary to ſubſtitute *fa*※ inſtead of *fa* natural in the harmony of *re* (BB).

108. Thus the generator *ut* may be followed according to pleaſure in aſcending diatonically either by a tonic dominant (*re fa※ la ut*), or by a ſimple dominant (*re fa la ut*).

109. In the minor mode of *la*, the tonic dominant *mi* ought always to imply its third major *mi ſol※*, when this dominant *mi* deſcends to the generator *la* (art. 83.); and the chord of this dominant ſhall be *mi ſol※ ſi re*, entirely ſimilar to *ſol ſi re fa*. With reſpect to the ſub-dominant *re*, it will immediately imply the third minor *fa*, to denominate the minor mode; and we may add *ſi* above its chord *re fa la*, in this manner *re fa la ſi*, a chord ſimilar to that of *fa la ut re*; and as we have deduced from the chord *fa la ut re* that of *re fa la ut*, we may in the ſame manner deduce from the chord *re fa la ſi* a new chord of the ſeventh *ſi re fa la*, which will exhibit the *double employment of diſſonances* in the minor mode.

110. One may employ this chord *ſi re fa la*, to preſerve the impreſſion of the mode of *la* in the diatonic ſcale of the minor mode, and to prevent the neceſſity of twice repeating the ſound *mi*; but in this caſe, the *fa* muſt be rendered ſharp, and change this chord to *ſi re fa※ la*, the fifth of *ſi* is *fa※*, as we have ſeen above; this chord is then the inverſe of *re fa※ la ſi*, where the ſubdominant implies the third major, which ought not to ſurpriſe us. For in the minor mode of *la*, the ſecond tetrachord *mi fa※ ſol※ la* is exactly the ſame as it would be in the major mode of *la*; now, in the major mode of *la*, the ſub-dominant *re* ought to imply the third major *fa※*.

182 Diverſities in the minor mode more numerous than in the major.

111. From thence we may ſee that the minor mode is ſuſceptible of a much greater number of varieties than the major: likewiſe the major mode is the product of nature alone; whereas the minor is, in ſome meaſure, the product of art. But in return, the major mode has received from nature, to which it owes its immediate formation, a force and energy which the minor cannot boaſt.

CHAP. XIV. Of the Different Kinds of Chords of the Seventh.

183 [illegible]

112. THE diſſonance added to the chord of the dominant and of the ſub-dominant, though in ſome meaſure inſinuated by nature (chap. xi.), is nevertheleſs a work of art; but as it produces great beauties in harmony by the variety which it introduces into it, let us diſcover whether in conſequence of this firſt advance, art may not ſtill be carried farther.

113. We have already three different kinds of chords of the ſeventh, *viz.*

184 [illegible]

1. The chord *ſol ſi re fa*, compoſed of a third major followed by two thirds minor.

2. The chord *re fa la ut*, or *ſi re fa※ la*, compoſed of a third major between two minors.

3. The chord *ſi re fa la*, compoſed of two thirds minor followed by a major.

114. There are ſtill two other kinds of chords of the ſeventh which are employed in harmony; one is compoſed of a third minor between two thirds major, as *mi ſol ſi*, or *fa la ut mi*; the other is wholly compoſed of thirds minor *ſol※ ſi re fa*. Theſe two chords, which at firſt appear as if they ought not to enter into harmony if we rigorouſly keep to the preceding rules, are nevertheleſs frequently practiſed with ſucceſs in the fundamental baſs. The reaſon is this:

185 The chords [illegible] admiſſible, and why.

115. According to what has been ſaid above, if we would add a ſeventh to the chord *ut mi ſol*, to make a dominant of *ut*, one can add nothing but *ſi*♭; and in this caſe *ut mi ſol ſi*♭ would be the chord of the tonic dominant in the mode of *fa*, as *ſol ſi re fa* is the chord of the tonic dominant in the mode of *ut*; but if you would preſerve the impreſſion of the mode of *ut* in the harmony, you then change this *ſi*♭ into *ſi* natural, and the chord *ut mi ſol ſi*♭ becomes *ut mi ſol ſi*. It is the ſame caſe with the chord *fa la ut mi*, which is nothing elſe but the chord *fa la ut mi*♭; in which one may ſubſtitute for *mi*♭, *mi* natural, to preſerve the impreſſion of the mode of *ut*, or of that of *fa*.

Beſides, in ſuch chords as *ut mi ſol ſi*, *fa la ut mi*, the ſounds *ſi* and *mi*, though they form a diſſonance with

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(BB) We need only add, that it is eaſy to ſee, that this fundamental baſs *ut ſol*, *ut fa*, *ut re*, *ſol ut*, which formed the aſcending ſcale *ut*, *re*, *mi*, *fa*, *ſol*, *la*, *ſi*, *UT*, cannot by inverting it, and taking it inverſely in this manner *ſi*, *ut*, *ſol*, *re*, *ut*, *fa*, *ut*, *ſol*, *UT*, form the diatonic ſcale *UT*, *ſi*, *la*, *ſol*, *fa*, *mi*, *re*, [illegible] in reality, from the chord *ſol*, *ſi*, *re*, *fa*, we cannot paſs to the chord [illegible] *ſol*, *re*. It is for this reaſon that in order to have the fundamental baſs of the [illegible] *ut*, in deſcent, we muſt either determine to invert the fundamental baſs [illegible] *re*, *ſol*, *re*, *ſol*, *ut*, *fa*, *ut*, *ſol*, *ut*, in which the ſecond [illegible] and the [illegible] of the ſcale; or otherwiſe we muſt form the fundamental baſs *ut*, *ſol*, *re*, *ſol* [illegible] perfect chords major, except the ſecond *ſol*, which implies the chord [illegible] and which anſwer to the two notes of the ſcale *ſol*, *fa*, both comprehended in the chord [illegible]

Which ever of theſe two baſſes we ſhall chooſe, it is obvious that [illegible] ſhall be wholly in the mode of *ut*, but in the mode of *ut* and in that of *ſol*. From whence it [illegible] that the double employment which gives to the ſcale a fundamental baſs all in the ſame mode when [illegible] cannot do the ſame in deſcending; and that the fundamental baſs of the ſcale in deſcending will be neceſſarily in two different modes.

with *ut* in the first case, and with *fa* in the second, are nevertheless ſupportable to the ear, becauſe the ſounds *ſi* and *mi* (art. 19.) are already contained and underſtood, the firſt in the note *ut* of the chord *ut mi ſol ſi*, as likewiſe in the note *ſol* of the ſame chord; the ſecond in the note *la* of the chord *fa la ut mi*, as likewiſe in the note *ut* of the ſame chord. All together then ſeem to allow the artiſt to introduce the notes *ſi* and *mi* into theſe two chords (CC).

186 Chords of the ſeventh continued and explained.

116. With reſpect to the chord of the ſeventh *ſol*※ *ſi re fa*, wholly compoſed of thirds minor, it may be regarded as formed from the union of the two chords of the dominant and of the ſub-dominant in the minor mode. In effect, in the minor mode of *la*, for inſtance, theſe two chords are *mi ſol*※ *ſi re*, and *re fa la ſi*, whoſe union produces *mi*, *ſol*※, *ſi*, *re*, *fa*, *la*. Now, if we ſhould ſuffer this chord to remain thus, it would be diſagreeable to the ear, by its multiplicity of diſſonances, *re mi*, *mi*, *la*, *la ſol*※, *la ſi*, *re ſol*※, (art. 18.); ſo that, to avoid this inconveniency, the generator *la* is immediately expunged, which (art. 19.) is as it were underſtood in *re*, and the fifth or dominant *mi* whoſe place the ſenſible note *ſol*※ is ſuppoſed to hold: thus there remains no more than the chord *ſol*※ *ſi re fa*, wholly compoſed of thirds minor, and in which the dominant *mi* is conſidered as underſtood; in ſuch a manner that the chord *ſol*※ *ſi re fa* repreſents the chord of the tonic dominant *mi ſol*※ *ſi re*, to which we have joined the chord of the ſub-dominant *re fa la ſi*, but in which the dominant *mi* is always reckoned the principal note (DD).

117. Since, then, from the chord *mi ſol*※ *ſi re*, we may paſs to the perfect *la ut mi la*, and vice verſa, we may in like manner paſs from the chord *ſol*※ *ſi re fa* to the chord *la ut mi la*, and from this laſt to the chord *ſol*※ *ſi re fa*: this remark will be very uſeful to us in the ſequel.

CHAP. XV. *Of the Preparation of Diſcords.*

187 Diſſonance what.

118. In every chord of the ſeventh, the higheſt note, that is to ſay, the ſeventh above the fundamental, is called a *diſſonance* or *diſcord*; thus *fa* is the diſſonance of the chord *ſol ſi re fa*, *ut* in the chord *re fa la ut*, &c.

188 Manner of preparing diſſonances inveſtigated.

119. When the chord *ſol ſi re fa* follows the chord *ut mi ſol ut*, as this may happen, and in reality often happens, it is obvious that we cannot find the diſſonance *fa* in the preceding chord *ut mi ſol ut*. Nor ought it indeed to be found in that chord; for this diſſonance is nothing elſe but the ſub-dominant added to the harmony of the dominant to determine the mode: now, the ſub-dominant is not found in the harmony of the generator.

120. For the ſame reaſon, when the chord of the ſub-dominant *fa la ut re* follows the chord *ut mi ſol ut*, the note *re*, which forms a diſſonance with *ut*, is not found in the preceding chord.

It is not ſo when the chord *re fa la ut* follows the chord *ut mi ſol ut*: for *ut*, which forms a diſſonance in the ſecond chord, ſtands as a conſonance in the preceding.

189 Diſſonance is only tolerable to the ear when found in preceding chords.

121. In general, diſſonance being the production of art (chap. xi.), eſpecially in ſuch chords as are not of the tonic dominant nor ſub-dominant; the only means to prevent its diſpleaſing the ear by appearing too heterogeneous to the chord, is, that it may be, if we may ſpeak ſo, announced to the ear by being found in the preceding chord, and by that means ſerve to connect the two chords. From whence follows this rule:

190 Preparation of diſſonances how performed.

122. In every chord of the ſeventh, which is not the chord of the tonic dominant, that is to ſay, (art. 102.) which is not compoſed of a third major followed by two thirds minor, the diſſonance which this chord forms ought to ſtand as a conſonance in the chord which precedes it.

This is what we call a *prepared diſſonance*. See Preparation.

123. From thence it follows, that in order to prepare a diſſonance, it is abſolutely neceſſary that the fundamental baſs ſhould aſcend by the interval of a ſecond, as

UT mi ſol ut, *RE fa la ut*;

or deſcend by a third, as

UT mi ſol ut, *LA ut mi ſol*;

or deſcend by a fifth, as

UT mi ſol ut, *FA la ut mi*:

in every other caſe the diſſonance cannot be prepared. This is what may be eaſily aſcertained. If, for inſtance, the fundamental baſs riſes by a third, as *ut mi ſol ut*, *mi ſol ſi re*, the diſſonance *re* is not found in the chord *ut mi ſol ut*. The ſame might be ſaid of *ut mi ſol ut*, *ſol ſi re fa*, and *ut mi ſol ut*, *ſi re fa la*, in which the fundamental baſs riſes by a fifth or deſcends by a ſecond.

124. It may only be added, that when a tonic, that is to ſay, a note which carries with it a perfect chord, is followed by a dominant in the interval of a fifth or third, this procedure may be regarded as a proceſs from that ſame tonic to another, which has been

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(CC) On the contrary, a chord ſuch as *ut mi*♭ *ſol ſi*, in which *mi* would be flat, could not be admitted in harmony, becauſe in this chord the *ſi* is not included and underſtood in *mi*♭. It is the ſame caſe with ſeveral other chords, ſuch as *ſi re fa la*※, *ſi re*※ *fa la*, &c. It is true, that in the laſt of theſe chords, *la* is included in *fa*, but it is not contained in *re*※; and this *re*※ likewiſe forms with *fa* and with *la* a double diſſonance, which, joined with the diſſonance *ſi fa*, would neceſſarily render this chord not very pleaſing to the ear; we ſhall yet, however, ſee in the ſecond part, that this chord is ſometimes uſed.

(DD) We have ſeen (art. 109.) that the chord *ſi re fa la*, in the minor mode of *la*, may be regarded as the inverſe of the chord *re fa la ſi*; it would likewiſe ſeem, that, in certain caſes, this chord *ſi re fa la* may be conſidered as compoſed of the two chords *ſol ſi re fa*, *fa la ut re*, of the dominant and of the ſub-dominant of the major mode of *ut*; which chords may be joined together, after having excluded from them, 1. The dominant *ſol*, repreſented by its third major *ſi*, which is preſumed to retain its place. 2. The note *ut* which is underſtood in *fa*, which will form this chord *ſi re fa la*. The chord *ſi re fa la*, conſidered in this point of view, may be underſtood as belonging to the major mode of *ut* upon certain occaſions.

been rendered a dominant by the addition of the diſſonance.

Moreover, we have ſeen (art. 119. and 120.) that a diſſonance does not ſtand in need of preparation in the chords of the tonic dominant and of the ſub-dominant: from whence it follows, that every tonic carrying with it a perfect chord, may be changed into a tonic dominant (if the perfect chord be major), or into a ſub-dominant (whether the chord be major or minor) by adding the diſſonance all at once.

Chap. XVI. *Of the Rules for reſolving Diſſonances.*

191 Diſſonances to be reſolved, muſt be diſguiſed and made to appear in the character of harmonics.

125. We have ſeen (chap. v. and vi.) how the diatonic ſcale, ſo natural to the voice, is formed by the harmonies of fundamental ſounds; from whence it follows, that the moſt natural ſucceſſion of harmonical ſounds is to be diatonic. To give a diſſonance then, in ſome meaſure, as much the character of an harmonic ſound as may be poſſible, it is neceſſary that this diſſonance, in that part of the modulation where it is found, ſhould deſcend or riſe diatonically upon another note, which may be one of the conſonances of the ſubſequent chord.

192 In the chord of the tonic dominant, the diſſonance ſhould rather riſe than deſcend, and why.

126. Now in the chord of the tonic dominant it ought rather to deſcend than to riſe; for this reaſon. Let us take, for inſtance, the chord *ſol ſi re fa* followed by the chord *ut mi ſol ut*; the part which formed the diſſonance *fa* ought to deſcend to *mi* rather than riſe to *ſol*, though both the ſounds *mi* and *ſol* are found in the ſubſequent chord *ut mi ſol ut*; becauſe it is more natural and more conformed to the connection which ought to be found in every part of the muſic, that *ſol* ſhould be found in the ſame part where *ſol* has already been ſounded, whilſt the other part was ſounding *fa*, as may be here ſeen (parts firſt and fourth.)

Firſt part, - - - -	*fa mi*,
Second, - - -	*ſi ut*,
Third, - - - -	*re ut*,
Fourth, - - -	*ſol ſol*,
Fundamental baſs, - -	*ſol ut*,

193 Conſequences of the former rule.

127. For the ſame reaſon, in the chord of the ſimple dominant *re fa la ut*, followed by *ſol ſi re fa*, the diſſonance *ut* ought rather to deſcend to *ſi* than riſe to *re*.

194 Another conſonance.

128. In ſhort, for the ſame reaſon, we ſhall find, that in the chord of the ſub-dominant *fa la ut re*, the diſſonance *re* ought to riſe to *mi* of the following chord *ut mi ſol ut*, rather than deſcend to *ut*; whence may be deduced the following rules.

195 But is deduced from the former propoſitions.

129. 1°. In every chord of the dominant, whether tonic or ſimple, the note which conſtitutes the ſeventh, that is to ſay, the diſſonance, ought diatonically to deſcend upon one of the notes which form a conſonance in the ſubſequent chord.

2°. In every chord of the ſubdominant, the diſſonance ought to riſe diatonically upon the third of the ſubſequent chord.

196 Diſſonance reſolved, what. See Reſolution.

130. A diſſonance which deſcends or riſes diatonically according to theſe two rules, is called a *diſſonance reſolved*.

From theſe rules it is a neceſſary reſult, that the chord of the ſeventh *re fa la ut*, though one ſhould even conſider it as the inverſe of *fa la ut re*, cannot be ſucceeded by the chord *ut mi ſol ut*, ſince there is not in this laſt chord of *ſi* any note upon which the diſſonance *ut* of the chord *re fa la ut* can deſcend.

One may beſides find another reaſon for this rule, in examining the nature of the double employment of diſſonances. In effect, in order to paſs from *re fa la ut*, to *ut mi ſol ut*, it is neceſſary that *re fa la ut* ſhould in this caſe be underſtood as the inverſe of *fa la ut re*. Now the chord *re fa la ut* can only be conceived as the inverſe of *fa la ut re*, when this chord *re fa la ut* precedes or immediately follows the *ut mi ſol ut*; in every other caſe the chord *re fa la ut* is a primitive chord, formed from the perfect minor chord *re fa la*, to which the diſſonance *ut* was added, to take from *re* the character of a tonic. Thus the chord *re fa la ut*, could not be followed by the chord *ut mi ſol ut*, but after having been preceded by the ſame chord. Now, in this caſe, the *double employment* would be entirely a futile expedient, without producing any agreeable effect; becauſe, inſtead of this ſucceſſion of chords *ut mi ſol ut*, *re fa la ut*, *ut mi ſol ut*, it would be much more eaſy and natural to ſubſtitute this other, which furniſhes this natural proceſs, *ut mi ſol ut*, *fa la ut re*, *ut mi ſol ut*. The proper uſe of the double employment is, that, by means of inverting the chord of the ſub-dominant, it may be able to paſs from that chord thus inverted to any other chord except that of the tonic, to which it naturally leads.

Chap. XVII. *Of the Broken or Interrupted Cadence.*

197 The ſeat of perfection in cadences to be found in the fundamental baſs.

131. In a fundamental baſs which moves by fifths, there is always, as we have formerly obſerved, (chap. viii.), a repoſe more or leſs perfect from one ſound to another; and of conſequence there muſt likewiſe be a repoſe more or leſs perfect from one ſound to another in the diatonic ſcale, which reſults from that baſs. It may be demonſtrated by a very ſimple experiment, that the cauſe of a repoſe in melody is ſolely in the fundamental baſs expreſſed or underſtood. Let any perſon ſing theſe three notes *ut re ut*, performing on the *re* a ſhake, which is commonly called a *cadence*; the modulation will appear to him to be finiſhed after the ſecond *ut*, in ſuch a manner that the ear will neither expect nor wiſh any thing to follow. The caſe will be the ſame if we accompany this modulation with its natural fundamental baſs *ut ſol ut*: but if, inſtead of this baſs, we ſhould give it the following *ut ſol la*; in this caſe the modulation *ut re ut* would not appear to be finiſhed, and the ear would ſtill expect and deſire ſomething more. This experiment may eaſily be made.

198 Broken cadence what, and why. See Cadence.

132. This paſſage *ſol la*, when the dominant *ſol* diatonically aſcends upon the note *la*, inſtead of deſcending by a fifth upon the generator *ut*, as it ought naturally to do, is called a *broken cadence*; becauſe the perfect cadence *ſol ut*, which the ear expected after the dominant *ſol*, is, if we may ſpeak ſo, broken and ſuſpended by the tranſition from *ſol* to *la*.

133. From thence it follows, that if the modulation *ut re ut* appear finiſhed when we ſuppoſed no baſs to it at all, it is becauſe its natural fundamental baſs *ut ſol ut* is ſuppoſed to be implied; becauſe the ear deſires ſomething to follow this modulation, as ſoon as it is reduced to the neceſſity of hearing another baſs.

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199 Origin of interrupted cadence in the double employment of diſſonances.

134. The interrupted cadence may, as it ſeems to me, be conſidered as having its origin in the *double employment of diſſonances*; ſince this cadence, like the double employment, only conſiſts in a diatonic procedure of the baſs aſcending (chap. xii.). In effect, nothing hinders us to deſcend from the chord *ſol ſi re ſa* to the chord *ut mi ſol la*, by converting the tonic *ut* into a ſub-dominant, that is to ſay, by paſſing all at once from the mode of *ut* to the mode of *ſol*: now to deſcend from *ſol ſi re ſa* to *ut mi ſol la* is the ſame thing as to riſe from the chord *ſol ſi re ſa* to the chord *la ut mi ſol*, in changing the chord of the ſub-dominant *ut mi ſol la* for the imperfect chord of the dominant, according to the laws of the double employment.

200 Manner of performing this cadence.

135. In this kind of cadence, the diſſonance of the firſt chord is reſolved by deſcending diatonically upon the fifth of the ſubſequent chord. For inſtance, in the broken cadence *ſol ſi re ſa, la ut mi ſol*, the diſſonance *ſa* is reſolved by deſcending diatonically upon the fifth *mi*.

201 Interrupted cadence, what. See Cadence.

136. There is ſtill another kind of cadence called an *interrupted cadence*, where the dominant deſcends by a third to another dominant, inſtead of deſcending by a fifth upon the tonic, as in this proceſs of the baſs, *ſol ſi re ſa, mi ſol ſi re*; in the caſe of an interrupted cadence, the diſſonance of the former chord is reſolved by deſcending diatonically upon the octave of the fundamental note of the ſubſequent chord, as may be here ſeen, where *ſa* is reſolved upon the octave of *mi*.

202 Origin of this kind of cadence, likewiſe in the double employment.

137. This kind of interrupted cadence, as it ſeems to me, has likewiſe its origin in the double employment of diſſonances. For let us ſuppoſe theſe two chords in ſucceſſion, *ſol ſi re ſa, ſol ſi re mi*, where the note *ſol* is ſucceſſively a tonic dominant and ſub-dominant; that is to ſay, in which we paſs from the mode of *ut* to the mode of *re*; if we ſhould change the ſecond of theſe chords into the chord of the dominant, according to the laws of the double employment, we ſhall have the interrupted cadence *ſol ſi re ſa, mi ſol ſi re*.

CHAP. XVIII. *Of the Chromatic Species.*

203 Fundamental baſs may be formed by thirds major.

138. THE ſeries of fundamental baſs by fifths produces the diatonic ſpecies in common uſe (chap. vi.): now the third major being one of the harmonics of a fundamental ſound as well as the fifth, it follows, that we may form fundamental baſſes by thirds major, as we have already formed fundamental baſſes by fifths.

204 A chromatic interval or minor ſemitone, how found. See fig. 1.

139. If then we ſhould form this baſs *ut*, *mi*, *ſol*※, the two firſt ſounds carrying each along with it their thirds major and fifths, it is evident that *ut* will give *ſol*, and that *mi* will give *ſol*※: now the ſemitone which is between this *ſol* and this *ſol*※ is an interval much leſs than the ſemitone which is found in the diatonic ſcale between *mi* and *fa*, or between *ſi* and *ut*. This may be aſcertained by calculation (EE): it is for this reaſon that the ſemitone from *mi* to *fa* is called *major*, and the other *minor* (FF).

140. If the fundamental baſs ſhould proceed by thirds minor in this manner, *ut*, *mi*♭, a ſucceſſion which is allowed when we have inveſtigated the origin of the minor mode (chap. ix.), we ſhall find this modulation *ſol*, *ſol*♭, which would likewiſe give a minor ſemitone (GG.)

205 An intonation minor ſemitone difficult to be hit, and why.

141. The minor ſemitone is hit by young practitioners in intonation with more difficulty than the ſemitone major. For which this reaſon may be aſſigned: The ſemitone major which is found in the diatonic ſcale, as from *mi* to *fa*, reſults from a fundamental baſs by fifths *ut fa*, that is to ſay, by a ſucceſſion which is moſt natural, and for this reaſon the eaſieſt to the ear. On the contrary, the minor ſemitone ariſes from a ſucceſſion by thirds, which is ſtill leſs natural than the former. Hence, that ſcholars may truly hit the minor ſemitone, the following artifice is employed. Let us ſuppoſe, for inſtance, that they intend to riſe from *ſol* to *ſol*※; they riſe at firſt from *ſol* to *la*, then deſcend from *la* to *ſol*※ by the interval of a ſemitone major; for this *ſol* ſharp, which is a ſemitone major below *la*, proves a ſemitone minor above *ſol* [See the notes (EE) and (FF).]

206 Minor ſemitone to be found in every procedure of the fundamental baſs by thirds.

142. Every procedure of the fundamental baſs by thirds, whether major or minor, riſing or deſcending, gives the minor ſemitone. This we have already ſeen from the ſucceſſion of thirds in aſcending. The ſeries of thirds minor in deſcending, *ut*, *la*, gives *ut*, *ut*※ (HH:)

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(EE) In reality, *ut* being ſuppoſed 1, as we have always ſuppoſed it, *mi* is $\frac{4}{5}$, and *ſol*※ [illegible]: now *ſol* being $\frac{2}{3}$, *ſol*※ then ſhall be to *ſol* as [illegible] to [illegible]; that is to ſay, as 25 times 2 to 3 times 16: the proportion then of *ſol*※ to *ſol* is as 25 to 24, an interval much leſs than that of 16 to 15, which conſtitutes the ſemitone from *ut* to *ſi*, or from *fa* to *mi* (note L.)

(FF) It may be obſerved, that a minor ſemitone joined to a major ſemitone will form a minor tone; that is to ſay, if one riſes, for inſtance, from *mi* to *fa*, by the interval of a ſemitone major, and afterwards from *fa* to *fa*※ by the interval of a minor ſemitone, the interval from *mi* to *fa*※ will be a minor tone. For let us ſuppoſe *mi* to be 1, *fa* will be $\frac{16}{15}$, and *fa*※ will be $\frac{25}{24}$ of $\frac{16}{15}$; that is to ſay, 25 times 16 divided by 24 times 15, or $\frac{10}{9}$, *mi* then is to *fa*※ as 1 is to $\frac{10}{9}$, the interval which conſtitutes the minor tone (note N.).

With reſpect to the tone major, it cannot be exactly formed by two ſemitones; for, 1. Two major ſemitones in immediate ſucceſſion would produce more than a tone major. In effect, $\frac{16}{15}$ multiplied by $\frac{16}{15}$ gives [illegible], which is greater than $\frac{9}{8}$, the interval which conſtitutes (note N) the major tone. 2. A ſemitone minor and a ſemitone major would give leſs than a major tone, ſince they amount only to a true minor tone. 3. And, *a fortiori*, two minor ſemitones would give ſtill leſs.

(GG) In effect, *mi*♭ being $\frac{5}{6}$, *ſol*♭ will be $\frac{5}{6}$ of $\frac{5}{6}$; that is to ſay, (note C) $\frac{25}{36}$: now the proportion of $\frac{2}{3}$ to $\frac{25}{36}$ (note C) is that of 3 times 25 to 2 times 36; that is to ſay, as 25 to 24.

(HH); and the ſeries of thirds major in deſcending, *ut*, *la*♭, gives *ut*, *ut*♭, (II).

207 The minor ſemitone when prevalent, conſtitutes chromatic muſic.

143. The minor ſemitone conſtitutes the ſpecies called *chromatic;* and with the ſpecies which moves by diatonic intervals, reſulting from the ſucceſſion of fifths (chap. v. and vi.), it comprehends the whole of melody.

Chap. XIX. *Of the Enharmonic Species.*

208 Dieſis or enharmonic interval, what, and how formed. * See Fourth of a Tone.

144. The two extremes, or higheſt and loweſt notes, *ut ſol*※, of the fundamental baſs by thirds major, *ut mi ſol*※, give this modulation *ut ſi*※; and theſe two ſounds *ut*, *ſi*※, differ between themſelves by a ſmall interval which is called the *dieſis*, or *enharmonic fourth** *of a tone* (LL), which is the difference between a ſemitone major and a ſemitone minor (MM). This quarter tone is inappretiable by the ear, and impracticable upon ſeveral of our inſtruments. Yet have means been found to put it in practice in the following manner, or rather to perform what will have the ſame effect upon the ear.

209 Manner of ſeemingly introducing this interval upon inſtruments of fixed ſcales.

145. We have explained (art. 116.) in what manner the chord *ſol*※ *ſi re fa* may be introduced into the minor mode, entirely conſiſting of thirds minor perfectly true, or at leaſt ſuppoſed ſuch. This chord ſupplying the place of the chord of the dominant (art. 116.) from thence we may paſs to that of the tonic or generator *la* (art. 117.). But we muſt remark,

1. That this chord *ſol*※ *ſi re fa*, entirely conſiſting of thirds minor, may be inverted or modified according to the three following arrangements, *ſi re fa ſol*※, *re fa ſol*※ *ſi fa ſol*※ *ſi re;* and that in all theſe three different ſtates, it will ſtill remain compoſed of thirds minor; or at leaſt there will only be wanting the enharmonic fourth of a tone to render the third minor between *fa* and *ſol*※ entirely juſt; for a true third minor, as that from *mi* to *ſol* in the diatonic ſcale, is compoſed of a ſemitone and a tone both major. Now from *fa* to *ſol* there is a tone major, and from *ſol* to *ſol*※ there is only a minor ſemitone. There is then awanting (art. 144.) the enharmonic fourth of a tone, to render the third *fa ſol*※ exactly true.

2. But as this diviſion of a tone cannot be found in the gradations of any ſcale practicable upon moſt of our inſtruments, nor be appretiated by the ear, the ear takes the different chords,

ſi re fa ſol※
re fa ſol※ *ſi*,
fa ſol※ *ſi re*,

which are abſolutely the ſame, for chords compoſed every one of thirds minor exactly juſt.

Now the chord *ſol*※ *ſi re fa*, belonging to the minor mode of *la*, where *ſol*※ is the ſenſible note; the chord *ſi re fa ſol*※, or *ſi re fa la*♭, will, for the ſame reaſon, belong to the minor mode of *ut*, where *ſi* is the ſenſible note. In like manner, the chord *re fa ſol*※ *ſi*, or *ſi re fa la*♭ *ut*♭, will belong to the minor mode of *mi*♭, and the chord *fa ſol*※ *ſi re*, or *fa la*♭ *ut*♭ *mi*♭♭, to the minor mode of *ſol*♭.

After having paſſed then by the mode of *la* to the chord *ſol*※ *ſi re fa* (art. 117.), one may by means of this laſt chord, and by merely ſatisfying ourſelves to invert it, afterwards paſs all at once to the modes of *ut* minor, of *mi*♭ minor, or of *ſol*♭ minor; that is to ſay, into the modes which have nothing, or almoſt

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(HH) *La* being $\frac{5}{6}$, *ut*※ is $\frac{5}{4}$ of $\frac{5}{6}$; that is to ſay $\frac{25}{24}$, and *ut* is 1: the proportion then between *ut* and *ut*※ is that of 1 to $\frac{25}{24}$, or of 24 to 25.

(II) *La* being the third major below *ut*, will be $\frac{4}{5}$ (note C): *ut*♭, then, is $\frac{7}{5}$ of $\frac{4}{5}$; that is to ſay $\frac{24}{25}$. The proportion, then, between *ut* and *ut*♭, is as 25 to 24.

(LL) *Sol*※ being $\frac{25}{16}$ and *ſi*※ being $\frac{5}{4}$ of $\frac{25}{16}$, we ſhall have *ſi*※ equal (note C) to $\frac{125}{64}$, and its octave below ſhall be $\frac{125}{128}$; an interval leſs than unity by about $\frac{3}{128}$ or $\frac{1}{43}$. It is plain then from this fraction, that the *ſi*※ in queſtion muſt be conſiderably lower than *ut*.

This interval has been called *the fourth of a tone*, and this denomination is founded on reaſon. In effect, we may diſtinguiſh in muſic four kinds of quarter tones.

1. The fourth of a tone major: now, a tone major being $\frac{9}{8}$, and its difference from unity being $\frac{1}{8}$, the difference of this quarter tone from unity will be almoſt the fourth of $\frac{1}{8}$; that is to ſay, $\frac{1}{32}$.

2. The fourth of a tone minor; and as a tone minor, which is $\frac{10}{9}$, differs from unity by $\frac{1}{9}$, the fourth of a minor tone will differ from unity about $\frac{1}{36}$.

3. One half of a tone major; and as this ſemitone differs from unity by $\frac{1}{15}$, one half of it will differ from unity about $\frac{1}{30}$.

4. Finally, one half of a ſemitone minor, which differs from unity by $\frac{1}{24}$: its half then will be $\frac{1}{48}$.

The interval, then, which forms the enharmonic fourth of a tone, as it does not differ from unity but by $\frac{1}{42}$, may juſtly be called the *fourth of a tone*, ſince it is leſs different from unity than the largeſt interval of a quarter tone, and more than the leaſt.

We ſhall add, that ſince the enharmonic fourth of a tone is the difference between a ſemitone major and a ſemitone minor; and ſince the tone minor is formed (note FF) of two ſemitones, one major and the other minor; it follows, that two ſemitones major in ſucceſſion form an interval larger than that of a tone by the enharmonic fourth of a tone; and that two minor ſemitones in ſucceſſion form an interval leſs than a tone by the ſame fourth of a tone.

(MM) That is to ſay, that if you riſe from *mi* to *fa*, for inſtance, by the interval of a ſemitone major, and afterwards, returning to *mi*, you ſhould riſe by the interval of a ſemitone minor to another ſound which is not in the ſcale, and which I ſhall mark thus, *fa*+, the two ſounds *fa*+ and *fa* will form the enharmonic fourth of a tone: for *mi* being 1, *fa* will be $\frac{16}{15}$; and *fa*+ $\frac{25}{24}$: the proportion then between *fa*+ and *fa* is that of $\frac{25}{24}$ to $\frac{16}{15}$ (note C); that is to ſay, as 25 times 15 to 16 times 24; or otherwiſe, as 25 times 5 to 16 times 8, or as 125 to 128. Now this proportion is the ſame which is found in the beginning of the preceding note, to expreſs the enharmonic fourth of a tone.

nothing, in common with the minor mode of *la*, and which are entirely foreign to it (†).

210 The alteration however, by which it is effectuated, abrupt and ſenſible.

146. It muſt, however, be acknowledged, that a tranſition ſo abrupt, and ſo little expected, cannot deceive nor elude the ear; it is ſtruck with a ſenſation ſo unlooked-for without being able to account for the paſſage to itſelf. And this account has its foundation in the enharmonic fourth of a tone; which is overlooked as nothing, becauſe it is inappretiable by the ear; but of which, though its value is not aſcertained, the whole harſhneſs is ſenſibly perceived. The inſtant of ſurpriſe, however, immediately vaniſhes; and that aſtoniſhment is turned into admiration, when one feels himſelf tranſported as it were all at once, and almoſt imperceptibly, from one mode to another, which is by no means relative to it, and to which he never could have immediately paſſed by the ordinary ſeries of fundamental notes.

CHAP. XX. *Of the Diatonic Enharmonic Species.*

147. If we form a fundamental baſs, which riſes alternately by fifths and thirds, as *fa*, *ut*, *mi*, *ſi*, this baſs will give the following modulation, *fa*, *mi*, *mi*, *re*※; in which the ſemitones from *fa* to *mi*, and from *mi* to *re*※, are equal and major (NN). See fig. M.

This ſpecies of modulation or of harmony, in which all the ſemitones are major, is called the *enharmonic diatonical* ſpecies. The major ſemitones peculiar to this ſpecies give it the name of *diatonic*, becauſe major ſemitones belong to the diatonic ſpecies; and the tones which are greater than major by the exceſs of a fourth, reſulting from a ſucceſſion of major ſemitones, give it the name of *enharmonic* (note LL). See Enharmonic.

CHAP. XXI. *Of the Chromatic Enharmonic Species.*

211 Chromatic enharmonic intervals, how formed. See fig. N.

148. If we paſs alternately from a third minor in deſcending to a third major in riſing, as *ut*, *ut*, *la*, *ut*※, *ut*※, we ſhall form this modulation *mi*♭, *mi*, *mi*, *mi*, *mi*※, in which all the ſemitones are minor (OO).

This ſpecies is called the *chromatic enharmonical* ſpecies: the minor ſemitones peculiar to this kind give it the name of *chromatic*, becauſe minor ſemitones belong to the chromatic ſpecies; and the ſemitones which are leſſer by the diminution of a fourth reſulting from a ſucceſſion of minor ſemitones, give it the name of *enharmonic* (note LL).

212 From this ſpecies the effects of harmony and melody appear to be in the fundamental baſs.

149. Theſe new ſpecies confirm what we have all along ſaid, that the whole effects of harmony and melody reſide in the fundamental baſs.

213 Diatonic ſpecies moſt agreeable, and why.

150. The diatonic ſpecies is the moſt agreeable, becauſe the fundamental baſs which produces it is formed from a ſucceſſion of fifths alone, which is the moſt natural of all others.

214 The chromatic next.

151. The chromatic being formed from a ſucceſſion of thirds, is the moſt natural after the preceding.

215 Laſtly, the enharmonic.

152. Finally, the enharmonic is the leaſt agreeable of all, becauſe the fundamental baſs which gives it is not immediately indicated by nature. The fourth of a tone which conſtitutes this ſpecies, and which is itſelf inappretiable to the ear, neither produces nor can produce its effect, but in proportion as imagination ſuggeſts the fundamental baſs from whence it reſults; a baſs whoſe procedure is not agreeable to nature, ſince it is formed of two ſounds which are not contiguous one to the other in the ſeries of thirds (art. 144.)

CHAP. XXII. *Showing that Melody is the Offspring of Harmony.*

216 The effects of melody to be inveſtigated in harmony expreſſed or underſtood.

153. All that we have hitherto ſaid, as it ſeems to me, is more than ſufficient to convince us, that melody has its original principle in harmony; and that it is in harmony, expreſſed or underſtood, that we ought to look for the effects of melody.

154. If this ſhould ſtill appear doubtful, nothing more is neceſſary than to pay due attention to the firſt experiment (art. 19.), where it may be ſeen that the principal ſound is always the loweſt, and that the ſharper ſounds which it generates are with relation to it what the treble of an air is to its baſs.

155. Yet more, we have proved, in treating of broken cadence (chap. xvii.), that the diverſification of baſſes

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(†) As this method for obtaining or ſupplying enharmonic gradations cannot be practiſed on every occaſion when the compoſer or practitioner would wiſh to find them, eſpecially upon inſtruments where the ſcale is fixed and invariable, except by a total alteration of their œconomy, and re-tuning the ſtrings, Dr Smith in his Harmonics has propoſed an expedient for redreſſing or qualifying this defect, by the addition of a greater number of keys or ſtrings, which may divide the tone or ſemitone into as many appretiable or ſenſible intervals as may be neceſſary. For this, as well as for the other advantageous improvements which he propoſes in the ſtructure of inſtruments, we cannot with too much warmth recommend the peruſal of his learned and ingenious book to ſuch of our readers as aſpire to the character of genuine adepts in the the theory of muſic.

(NN) It is obvious, that if *fa* in the baſs be ſuppoſed 1, *fa* of the ſcale will be 2, *ut* of the baſs $\frac{3}{2}$, and *mi* of the ſcale $\frac{5}{4}$ of $\frac{3}{2}$, that is, $\frac{15}{8}$; the proportion of *fa* to *mi* is as 2 to $\frac{15}{8}$, or as 1 to $\frac{15}{16}$. Now *mi* of the baſs being likewiſe $\frac{5}{4}$ of $\frac{3}{2}$, or $\frac{15}{8}$; *ſi* of the baſs is $\frac{3}{2}$ of $\frac{15}{8}$, and its third major *re*※ $\frac{5}{4}$ of $\frac{3}{2}$ of $\frac{15}{8}$, or $\frac{15}{8}$ of $\frac{15}{8}$; this third major, approximated as much as poſſible to *mi* in the ſcale by means of octaves, will be $\frac{15}{16}$ of $\frac{15}{8}$: *mi* then of the ſcale will be to *re*※ which follows it, as $\frac{15}{8}$ is to $\frac{15}{16}$ of $\frac{15}{8}$, that is to ſay, as 1 to $\frac{15}{16}$. The ſemitones then from *fa* to *mi*, and from *mi* to *re*※, are both major.

(OO) It is evident that *mi*♭ is $\frac{6}{5}$ (note C), and that *mi* is $\frac{5}{4}$: theſe two *mi*'s, then, are between themſelves as $\frac{6}{5}$ to $\frac{5}{4}$, that is to ſay, as 6 times 4 to 5 times 5, or as 24 to 25, the interval which conſtitutes the minor ſemitone. Moreover, the *la* of the baſs is $\frac{5}{6}$, and *ut*※ $\frac{5}{4}$ of $\frac{5}{6}$, or $\frac{25}{24}$: *mi*※ then is $\frac{5}{4}$ of $\frac{25}{24}$, the *mi* in the ſcale is likewiſe to the *mi*※ which follows it, as 24 to 25. All the ſemitones therefore in this ſcale are minor.

Theory of Harmony. baſſes produces effects totally different in a modulation which, in other reſpects, remains the ſame.

156. Can it be ſtill neceſſary to adduce more convincing proofs? We have nothing to do but examine the different baſſes which may be given to this very ſimple modulation *ſol, ut;* of which it will be found ſuſceptible of a great many, and each of theſe baſſes will give a different character to the modulation *ſol ut*, though in itſelf it remains always the ſame; in ſuch a manner that we may change the whole nature and effects of a modulation, without any other alteration except that of changing its fundamental baſs.

M. Rameau has ſhown, in his *New Syſtem of Muſic*, printed at Paris 1726, p. 44. that this modulation *ſol ut*, is ſuſceptible of 20 different fundamental baſſes. Now the ſame fundamental baſs, as may be ſeen in our ſecond part, will afford ſeveral continued or thorough baſſes. How many means, of conſequence, may be practiſed to vary the expreſſion of the ſame modulation?

217 Conſequences deducible from this principle.

157. From theſe different obſervations it may be concluded, 1. That an agreeable melody, naturally implies a baſs extremely ſweet and adapted for ſinging; and that reciprocally, as muſicians expreſs it, a baſs of this kind generally prognoſticates an agreeable melody (PP).

2. That the character of a juſt harmony is only to form in ſome meaſure one ſyſtem with the modulation, ſo that from the whole taken together the ear may only receive, if we may ſpeak ſo, one ſimple and indiviſible impreſſion.

3. That the character of the ſame modulation may be diverſified, according to the character of the baſs which is joined with it.

But notwithſtanding the dependency of melody upon harmony, and the ſenſible influence which the latter may exert upon the former; we muſt not however from thence conclude, with ſome celebrated muſicians, that the effects of harmony are preferable to thoſe of melody. Experience proves the contrary. [See, on this account, what is written on the licence of muſic, printed in tom. iv. of D'Alembert's *Melanges de Literature*, p. 448.]

GENERAL REMARK.

THE diatonic ſcale or gammut being compoſed of twelve ſemitones, it is clear that each of theſe ſemitones taken by itſelf may be the generator of a mode; and that thus there muſt be twenty-four modes in all, twelve major and twelve minor. We have aſſumed the major mode of *ut*, to repreſent all the major modes in general, and the minor mode of *la*, to repreſent the modes minor, to avoid the difficulties ariſing from ſharps and flats, of which we muſt have encountered either a greater or leſſer number in the other modes. But the rules we have given for each mode are general, whatever note of the gammut be taken for the generator of a mode.

PART II. PRINCIPLES and RULES of COMPOSITION.

218 Compoſition in harmony, what See Compoſition.

158. COMPOSITION, which is likewiſe called *counterpoint*, is not only the art of compoſing an agreeable air, but alſo that of compoſing a great many airs in ſuch a manner that when heard at the ſame time, they may unite in producing an effect agreeable and delightful to the ear; this is what we call *compoſing muſic in ſeveral parts*.

The higheſt of theſe parts is called the *treble*, the loweſt is termed the *baſs;* the other parts, when there are any, are termed *middle parts;* and each in particular is ſignified by a different name.

CHAP. I. *Of the Different Names given to the ſame Interval.*

219 Particular intervals ſignified by different names, and why.

159. IN the introduction (art. 9.), which is at the front of this treatiſe, we have ſeen a detail of the moſt common names which are given to the different intervals. But there are particular intervals which have obtained different names, according to particular circumſtances; which it is proper to explain.

220 Second redundant, what.

160. An interval compoſed of a tone and a ſemitone, which is commonly called a *third minor*, is likewiſe ſometimes called a *ſecond redundant;* ſuch is the interval from *ut* to *re*※ in aſcending, or that of *la* to *ſol*♭ deſcending.

221 Why ſo called.

This interval is ſo termed, becauſe one of the ſounds which form it is always either ſharp or flat, and that, if you deduce that ſharp or that flat, the interval will be that of a ſecond.

222 Falſe fifth, what.

161. An interval compoſed of two tones and two ſemitones, as that from *ſi* to *fa*, is called a *falſe fifth*. This interval is the ſame with the *triton* (art. 9.), ſince two tones and two ſemitones are equivalent to three tones. There are, however, ſome reaſons for diſtinguiſhing them, as will appear below.

223 Fifth redundant, what.

162. As the interval from *ut* to *re*※ in aſcending has been called a ſecond redundant, they likewiſe call the interval from *ut* to *ſol*※ in aſcending a *fifth redundant*, or from *ſi* to *mi*※ in deſcending, each of which intervals are compoſed of four tones.

224 Diſtinguiſhed from the ſixth minor.

This interval is, in the main, the ſame with that of the ſixth minor (art. 6.): but in the fifth redundant there is always a ſharp or a flat; inſomuch, that if this ſharp or flat were deduced, the interval would become a true fifth.

225 Seventh diminiſhed, what.

163. For the ſame reaſon, an interval compoſed of three tones and three ſemitones, as from *ſol*※ to *fa* in aſcending,

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(PP) There are likewiſe ſeveral eminent muſicians, who in their compoſitions, if we can depend on what has been affirmed, begin with determining and writing the baſs. This method, however, appears in general more proper to produce a learned and harmonious muſic, than a ſtrain prompted by genius and animated by enthuſiaſm.

aſcending, is called a *ſeventh diminiſhed;* becauſe, if you deduce the ſharp from *ſol*, the interval from *ſol* to *fa* will become that of an ordinary ſeventh. The interval of a ſeventh diminiſhed is in other reſpects the ſame with that of the ſixth major (art. 9.)

226 Seventh major and redundant coincident.

164. The major ſeventh is likewiſe ſometimes called a *ſeventh redundant* (QQ.)

Chap. II. *Compariſon of the Different Intervals.*

227 Notes in different octaves or ſcales replications each of the other.

165. If we ſing *ut ſi* in deſcending by a ſecond, and afterwards *ut ſi* in aſcending by a ſeventh, theſe two *ſi*'s ſhall be octaves one to the other; or, as we commonly expreſs it, they will be *replications* one of the other.

228 Hence to deſcend to one replication, and riſe to another, has the ſame effect.

166. On account then of the reſemblance between every ſound and its octave (art. 22.), it follows, that *to riſe by a ſeventh*, or *deſcend by a ſecond*, amount to one and the ſame thing.

167. In like manner, it is evident that the ſixth is nothing but a replication of the third, nor the fourth but a replication of the fifth.

229 Detail of replications.

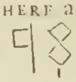
168. The following expreſſions either are or ought to be regarded as ſynonymous.

230 Examples of this.

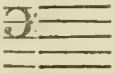
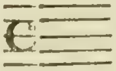
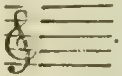
To riſe	by a ſecond.	To deſcend	by a ſeventh.
To deſcend		To riſe	
To riſe	by a third.	To deſcend	by a ſixth.
To deſcend		To riſe	
To riſe	by a fourth.	To deſcend	by a fifth.
To deſcend		To riſe	

169. Thus, therefore, we ſhall employ them indifferently the one for the other; ſo that when we ſay, for inſtance, *to riſe by a third*, it may be ſaid with equal propriety *to deſcend by a ſixth*, &c.

Chap. III. *Of the different Cleffs; of the Value or Quantity; of the Rithmus; and of Syncopation.*

170. There are three cleffs* in muſic; the cleff of *fa* 𝄢:, or ; the cleff *ut* 𝄡; and the cleff of *ſol* 𝄞. But, in Britain, the following characters are

231 Cleffs, what,

uſed: The F, or baſs-cleff ; the C, or tenor cleff ; and the G, or treble cleff .

* See Cleff.

232 And how placed. See fig. O.

The cleff of *fa* is placed on the fourth line, or on the third; and the line upon which this cleff is placed gives the name of *fa* or *F*, to all the notes which are upon that line.

See fig. P.

The cleff of *ut* is placed upon the fourth, the third, the ſecond, or the firſt line; and in theſe different poſitions all the notes upon that line where the cleff is placed take the name of *ut*, or *C*.

See fig. Q.

Laſtly, the cleff of *ſol* is placed upon the ſecond or firſt line; and all the notes upon that line where the cleff is placed take the name of *ſol* or *G*.

233 Names of notes to be inveſtigated from the poſition of the cleffs. See fig. O.

171. As the notes are placed on the lines, and in the ſpaces between the lines, any one, when he ſees the cleff, may eaſily find the name of any note whatever. Thus he may ſee, that, in the firſt cleff of *fa*, the note which is placed on the loweſt line ought to be *ſol;* that the note which occupies the ſpace between the two firſt lines ſhould be *la;* and that the note which is on the ſecond line is a *ſi*, &c. (RR).

172. A

(QQ) The chief uſe of theſe different denominations is to diſtinguiſh chords: for inſtance, the chord of the redundant fifth and that of the diminiſhed ſeventh are different from the chord of the ſixth; the chord of the ſeventh redundant, from that of the ſeventh major. This will be explained in the following chapters.

(RR) It is on account of the different compaſſes of voices and inſtruments that theſe cleffs have been invented.

The maſculine voice, which is the loweſt, may at its greateſt depth, without ſtraining, deſcend to *ſol*, which is in the laſt line of the firſt cleff of *fa;* and the female voice, which is the ſharpeſt, may at its higheſt pitch riſe to a *ſol*, which is a triple octave above the former.

The loweſt of maſculine voices is adapted to a part which may be called a *mean baſs*, and its cleff is that of *fa* on the fourth line; this cleff is likewiſe that of the violoncello and of the deepeſt inſtruments. A mean baſs extremely deep is called a *baritonus* or *counter-baſs*.

The maſculine voice which is next in depth to what we have called the *mean baſs* may be termed the *concordant baſs*. Its cleff is that of *fa* on the third line.

The maſculine voice which follows the *concordant baſs* may be denominated a *tenor;* a voice of this pitch is the moſt common, yet ſeldom extremely agreeable. Its cleff is that of *ut* on the fourth line. This cleff is alſo that of the baſſoon or baſs hautboy.

The higheſt maſculine voice of all may be called *counter tenor*. Its cleff is that of *ut* on the third line. It is likewiſe the cleff of tenor violins, &c.

The deepeſt female voice immediately follows the counter tenor, and may be called *baſs in alt*. Its cleff is that of *ut* upon the firſt line. The cleff of *ut* upon the ſecond line is not in frequent uſe.

ſharpeſt female voice is called *treble;* its cleff is that of *ſol* on the ſecond line.

hat cleff, as well as that of *ſol* on the firſt line, is likewiſe the cleff of the ſharpeſt inſtruments, ſuch as n, the flute, the trumpet, the hautboy, the flagelet, &c.

which may be ſeen in the cleffs of *fa* and in the cleffs of *ut* is a fifth above the *fa* which is on the cleff of *fa;* and the *ſol* which is on the two cleffs of *ſol* is a fifth above *ut:* inſomuch that *ſol* which is

Principles of Compoſition.

234 Marks and powers of ſharps, flats, and naturals, what.

172. A note before which there is a ſharp (marked thus ※) ought to be raiſed by a ſemitone; and if, on the contrary, there is a ♭ before it, it ought to be depreſſed by a ſemitone, (♭ being the mark of a flat.)

The natural (marked thus ♮) reſtores to its natural value a note which had been raiſed or depreſſed by a ſemitone.

173. When you place at the cleff a ſharp or a flat, all the notes upon the line on which this ſharp or flat is marked are ſharp or flat. Thus let us take, for inſtance, the cleff of *ut* upon the firſt line, and let us place a ſharp in the ſpace between the ſecond and third line, which is the place of *fa;* all the notes which ſhall be marked in that ſpace will be *fa*※; and if you would reſtore them to their original value of *fa* natural, you muſt place a ♮ or a ♭ before them. See fig. R. See fig. S.

In the ſame manner, if a flat be marked at the cleff, and if you would reſtore the note to its natural ſtate, you muſt place a ♮ or a ※ before it. See fig. X.

235 Bars and times, what.

174. Every piece of muſic is divided into different equal times, which they call *meaſures* or *bars;* and each bar is likewiſe divided into different times.

There are properly two kinds of meaſures or modes of time (*See* T): the meaſure of two times, or of common time, which is marked by the figure 2 placed at the beginning of the tune; and the meaſure of three times, or of triple time, which is marked by the figure 3 placed in the ſame manner. (*See* V.) See Time.

The different bars are diſtinguiſhed by perpendicular lines.

In a bar we diſtinguiſh between the *perfect* and *imperfect* time; the *perfect* time is that which we *beat*, the *imperfect* that in which we *lift up the hand or foot*. A bar conſiſting of four times ought to be regarded as compounded of two bars, each conſiſting of two times: thus there are in this bar two perfect and two imperfect times. In general, by the words *perfect* and *imperfect*, even the parts of the ſame time are diſtinguiſhed: thus the firſt note of each time is reckoned as belonging to the *perfect* part, and the others as belonging to the *imperfect*. See fig. Y.

236 The value of notes in duration.

175. The longeſt of all notes is a ſemibreve. A minim is half its value; that is to ſay, in ſinging, we only employ the ſame duration in performing two minims which was occupied in one ſemibreve. A minim in the ſame manner is equivalent to two crotchets, the crotchet to two quavers, &c.

237 Syncopation, what.

176. A note which is divided into two parts by a time, that is to ſay, which begins at the end of a time, and terminates in the time following, is called (ss) a *ſyncopated note.* (*See* Z; where the notes *ut, ſi,* and *la*, are each of them ſyncopated.) (†). See Syncopation.

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is on the loweſt line of the firſt cleff of *fa*, is lower by two whole octaves than the *ſol* which is on the loweſt line of the ſecond cleff of *ſol.*

[Thus far the tranſlator has followed his original as accurately as poſſible; but this was by no means an eaſy taſk. Among all the writers on muſic which he has found in Engliſh, there is no ſuch thing as different names for each particular part which is employed to conſtitute full or complete harmony. He was therefore under a neceſſity of ſubſtituting by analogy ſuch names as appeared moſt expreſſive of his author's meaning. To facilitate this attempt, he examined in Rouſſeau's muſical dictionary the terms by which the different parts were denominated in D'Alembert; but even Rouſſeau, with all his depth of thought and extent of erudition, inſtead of expreſſing himſelf with that preciſion which the ſubject required, frequently applies the ſame names indiſcriminately to different parts, without aſſigning any reaſon for this promiſcuous and licentious uſe of words. The Engliſh reader therefore will be beſt able to form an accurate idea of the different parts, by the nature and ſituation of the cleffs with which they are marked; and if he ſhould find any impropriety in the names which are given them, he may adopt and aſſociate others more agreeable to his ideas.]

(ss) Syncopation conſiſts in a note which is protracted in two different times belonging partly to the one and partly to the other, or in two different bars; yet not ſo as entirely to occupy or fill up the two times, or the two bars. A note, for inſtance, which begins in the imperfect time of a bar, and which ends in the perfect time of the following, or which in the ſame bar begins in the imperfect part of one time and ends in the perfect of the following, is ſyncopated. A note which of itſelf occupies one or two bars, whether the meaſure conſiſts of two or three times, is not conſidered as ſyncopated: this is a conſequence of the preceding definition. This note is ſaid to be *continued* or *protracted.* In the end of the example Z, the *mi* of the firſt bar conſiſting of three times is not ſyncopated, becauſe it occupies two whole times. It is the ſame caſe with *mi* of the ſecond bar, and with the *ut* of the fourth and fifth. Theſe therefore are continued or protracted notes.

(†) *Times* and *bars* in muſic anſwer the very ſame end as punctuation in language. They determine the different periods of the movement, or the various degree of completion, which the ſentiment, expreſſed by that movement has attained. Let us ſuppoſe, for inſtance, a compoſer in muſic intending to expreſs grief or joy, in all its various gradations, from its firſt and fainteſt ſenſation, to its acme or higheſt poſſible degree. We do not ſay that ſuch a progreſs of any paſſion either has been or can be delineated in practice; yet it may ſerve to illuſtrate what we mean to explain. Upon this hypotheſis, therefore, the degrees of the ſentiment will paſs from leſs to more ſenſible, as it riſes to its moſt intenſe degree. The firſt of theſe gradations may be called a *time*, which is likewiſe the moſt convenient diviſion of a bar or meaſure into its elementary or aliquot parts, and may be deemed equivalent to a comma in a ſentence; a bar denotes a degree ſtill more ſenſible, and may be conſidered as having the force of a ſemicolon; a ſtrain brings the ſentiment to a tolerable degree of perfection, and may be reckoned equal to a colon: the full period is the end of the imitative piece. It muſt have been remarked by obſervers of meaſure in melody or harmony, that the notes of which a bar or meaſure conſiſts, are not diverſified by their different durations alone, but likewiſe by greater or leſſer degrees of emphaſis.

177. A note followed by a point or dot is increaſed half its value. The *ſi*, for inſtance, in the fifth bar of the example Y, followed by a point, has the value (*) or duration of a minim and of a crotchet at ſame time. 238 Value of a pointed note.

CHAP. IV. *Containing a Definition of the principal Chords.*

239 Perfect chords, what.

178. THE chord compoſed of a third, a fifth, and an octave, as *ut mi ſol ut*, is called a *perfect chord* (art. 32.)

If the third be major, as in *ut mi ſol ut*, the perfect chord is denominated *major*: if the third be minor, as in *la ut mi la*, the perfect chord is minor. The perfect chord major conſtitutes what we call the *major mode*; and the perfect chord minor, what we term the *minor mode* (art. 31).

240 Chord of the ſeventh, what, and how to be practiſed.

179. A chord compoſed of a third, a fifth, and a ſeventh, as *ſol ſi re fa*, or *re fa la ut*, &c. is called a *chord of the ſeventh*. It is obvious that ſuch a chord is wholly compoſed of thirds in aſcending.

All chords of the ſeventh are practiſed in harmony, ſave that which might carry the third minor and the ſeventh major, as *ut mi♭ ſol ſi*; and that which might carry a falſe fifth and a ſeventh major, as *ſi re fa la♯*, (chap. xiv. Part I.)

241 Thoſe of different kinds.

180. As thirds are either major or minor, and as they may be differently arranged, it is clear that there are different kinds of chords of the ſeventh; there is even one, *ſi re fa la*, which is compoſed of a third, a falſe fifth, and a ſeventh.

242 Of the greater ſixth, what.

181. A chord compoſed of a third, a fifth, and a ſixth, as *fa la ut re*, *re fa la ſi*, is called a *chord of the greater ſixth*.

243 Tonic, what, and its chords, how figured.

182. Every note which carries a perfect chord is called a *tonic*, and a perfect chord is marked by an 8, by a 3, or by a 5, which is written above the note; but frequently theſe numbers are ſuppreſſed. Thus in the example I. the two *ut*'s equally carry a perfect chord.

244 Dominant, what, and how figured.

183. Every note which carries a chord of the ſeventh is called a *dominant* (art. 102); and this chord is marked by a 7 written above the note. Thus in the example II. *re* carries the chord *re fa la ut*, and *ſol* the chord *ſol ſi re fa*.

It is neceſſary to remark, that among the chords of the ſeventh we do not reckon the chord of the ſeventh diminiſhed, which is only improperly called a *chord of the ſeventh*; and of which we ſhall ſay more below.

[244] Sub dominant, what, and how figured.

184. Every note which carries the chord of the great ſixth, is called a *ſubdominant*, (art. 97, and 42.) and is marked with a 6. Thus in the example III. *fa* carries the chord of *fa la ut re*. You ought to remark that the ſixth ſhould always be major, (art. 97, and 109.)

245 Fundamental note, what. See Fundamental.

185. In every chord, whether perfect, or a chord of the ſeventh, or of the great ſixth, the note which carries this chord, and which is the flatteſt or loweſt, is called the *fundamental note*. Thus *ut* in the example I. *re* and *ſol* in the example II. and *fa* in the example III. are fundamental notes.

246 Diſſonance of a chord, what.

186. In every chord of the ſeventh, and of the great ſixth, the note which forms the ſeventh or ſixth above the fundamental, that is to ſay, the higheſt note of the chord, is called a *diſſonance*. Thus in the chords of the ſeventh *ſol ſi re fa*, *re fa la ut*, *fa* and *ut* are the diſſonances, viz. *fa* with relation to *ſol* in the firſt chord, and *ut* with relation to *re* in the ſecond. In the chord of the great ſixth *fa la ut re*, *re* is the diſſonance (art. 120.); but that *re* is only, properly

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phaſis. The moſt emphatic parts of a bar are called the *accented parts*: thoſe which require leſs energy in expreſſions are called the *unaccented*. The ſame obſervation holds with regard to times as bars. The ſtroke, therefore, of the hand or foot in beating marks the accented part of the bar, the elevation or preparation for the ſtroke marks the unaccented part. Let us once more reſume our compoſition intended to expreſs the different periods in the progreſs of grief or joy. There are ſome revolutions in each of theſe ſo rapid as not to be marked by any ſenſible tranſition whether diatonic or conſonant. In this caſe, the moſt expreſſive tone may be continued from one part of a time or meaſure to another, and end before the period of that time or meaſure in which it begins. Here therefore is a natural principle upon which the practice of ſyncopation may be founded even in melody: but when muſic is compoſed in different parts to be ſimultaneouſly heard, the continuance of one note not divided by regular times and meaſures, nor beginning and ending with either of them, whilſt the other parts either aſcend or deſcend according to the regular diviſions of the movement, has not only a ſenſible effect in rendering the imitation more perfect, but even gives the happieſt opportunities of diverſifying the harmony, which of itſelf is a moſt delightful perception.

For the various diſpoſitions of accent in times and meaſures, according to the movement of any piece, ſee a Treatiſe on muſic by Alexander Malcolm.

For the opportunity of diverſifying harmony afforded by ſyncopation, ſee Rameau's Principles of Compoſition.

(*) To prevent ambiguity or confuſion of ideas, it is neceſſary to inform our readers, that we have followed M. D'Alembert in his double ſenſe of the word *value*, though we could have wiſhed he had diſtinguiſhed the different meanings by different words. A ſound may be either eſtimated by its different degrees of intenſeneſs, or by its different quantities of duration.

To ſignify both thoſe ideas the word *value* is employed by D'Alembert. The reader, therefore, will find it of importance to diſtinguiſh the value of a note in height from its value in duration. This he may eaſily do, by conſidering whether the notes are treated as parts of the diatonic ſcale, or as continued for a greater or leſſer duration.

properly ſpeaking, a diſſonance with relation to *ut* from which it is a *ſecond*, and not with reſpect to *fa* from which it is a *ſixth major* (art. 17, and 18).

247 Tonic and ſimple dominant, what.

187. When a chord of the ſeventh is compoſed of a third major, followed by two thirds minor, the fundamental note of this chord is called the *tonic dominant*. In every other chord of the ſeventh the fundamental is called the *ſimple dominant* (art. 102.) Thus in the chord *ſol ſi re fa*, the fundamental *ſol* is the *tonic dominant*; but in the other chords of the ſeventh, as *ut mi ſol ſi*, *re fa la ut*, &c. the fundamentals *ut* and *re* are *ſimple dominants*.

248 Major chords, how rendered minor, and vice verſa.

188. In every chord, whether perfect, or of the ſeventh, or of the ſixth, if you have a mind that the third above the fundamental note ſhould be major, though it is naturally minor, you muſt place a ſharp above the fundamental note. For example, if I would mark the perfect major chord *re fa* ※ *la re*, as the third *fa* above *re* is naturally minor, I place above *re* a ſharp, as you may ſee in example IV. In the ſame manner the chord of the ſeventh *re fa*※ *la ut*, and the chord of the great ſixth *re fa*※ *la ſi*, is marked with a ※ above *re*, and above the ※ a 7 or a 6 (ſee V. and VI.)

On the contrary, when the third is naturally major, and if you ſhould incline to render it minor, you muſt place above the fundamental note a ♭. Thus the examples VII. VIII. IX. ſhow the chords *ſol ſi*♭ *re ſol*, *ſol ſi*♭ *re fa*, *ſol ſi*○ *re mi* (TT).

CHAP. V. *Of the Fundamental Baſs.*

249 Fundamental baſs, how formed.

189. INVENT a modulation at your pleaſure; and under this modulation let there be ſet a baſs compoſed of different notes, of which ſome may carry a perfect chord, others that of the ſeventh, and others that of the great ſixth, in ſuch a manner that each note of the modulation which anſwers to each of the baſs, may be one of thoſe which enters into the chord of that note in the baſs; this baſs being compoſed according to the rules which ſhall be immediately given, will be the *fundamental baſs* of the modulation propoſed. See Part I. where *the nature and principles of the fundamental baſs* are explained.

See Fundamental baſs.

Thus (Exam. XVIII.) you will find that this modulation, *ut re mi fa ſol la ſi ut*, has or may admit for its fundamental baſs *ut* $\overset{7}{\textit{ſol}}$ *ut* $\overset{6}{\textit{fa}}$ *ut* $\overset{7}{\textit{re}}$ $\overset{7}{\textit{ſol}}$ *ut*.

In reality, the firſt note *ut* in the upper part is found in the chord of the firſt note *ut* in the baſs, which chord is *ut mi ſol ut*; the ſecond note *re* in the treble is found in the chord *ſol ſi re fa*, which is the chord of the ſecond note in the baſs, &c. and the baſs is compoſed only of notes which carry a perfect chord, or that of the ſeventh, or that of the great ſixth. Moreover, it is formed according to the rules which we are now about to give.

CHAP. VI. *Rules for the Fundamental Baſs.*

250 Rules for the formation of the baſs.

190. ALL the notes of the fundamental baſs being only capable of carrying a perfect chord, or the chord of the ſeventh, or that of the great ſixth, are either tonics, or dominants, or ſub-dominants; and the dominants may be either ſimple or tonic.

The fundamental baſs ought always to begin with a tonic, as much as it is practicable. And now follow the rules for all the ſucceeding chords; rules which are evidently derived from the principles eſtabliſhed in the *Firſt Part* of this treatiſe. To be convinced of this, we ſhall find it only neceſſary to review the articles 34, 91, 122, 124, 126, 127.

RULE I.

191. In every chord of the tonic, or of the tonic dominant, it is neceſſary that at leaſt one of the notes which form that chord ſhould be found in the chord that precedes it.

RULE II.

192. In every chord of the ſimple dominant, it is neceſſary

(TT) We may only add, that there is no occaſion for making theſe ſharps or flats when they are originally placed at the cleff. For inſtance, if the ſharp be upon the cleff of *fa* (ſee Exam. X.), one may ſatisfy himſelf with ſimply writing *re*, without a ſharp to mark the perfect chord major of *re*, *re fa*※ *la re*. In the ſame manner, in the Example XI. where the flat is at the cleff upon *ſi*, one may ſatisfy himſelf with ſimply writing *ſol*, to mark the perfect chord minor of *ſol ſi*○ *re ſol*.

But if a caſe occurs where there is a ſharp or a flat at the cleff, if any one would wiſh to render the chord minor which is major, or *vice verſa*, he muſt place above the fundamental note a ♮ or natural. Thus the Example XII. marks the minor chord *re fa la re*, and Example XIII. the major chord *ſol ſi re ſol*.—Frequently, in lieu of a natural, a flat is uſed to ſignify the minor chord, and a ſharp to ſignify the major. Thus Example XIV. marks the minor chord *re fa la re*, and Example XV. the major chord *ſol ſi re ſol*.

When in a chord of the great ſixth, the diſſonance, that is to ſay, the ſixth, ought to be ſharp, and when the ſharp is not found at the cleff, they write before or after the 6 a ※; and if this ſixth ſhould be flat according to the cleff, they write a ♮.

In the ſame manner, if in a chord of the ſeventh of the tonic dominant, the diſſonance, that is to ſay, the ſeventh, ought to be flat or natural, they write by the ſide of the ſeventh a ♭ or a ♮. Many muſicians, when a ſeventh from the ſimple dominant ought to be altered by a ſharp or a natural, have likewiſe written by the ſide of the ſeventh a ※ or a ♮; but M. Rameau ſuppreſſes theſe characters. The reaſon ſhall be given below, when we ſpeak of chords by ſuppoſition.

If there be a ſharp on the cleff of *fa*, and if I ſhould incline to mark the chord *ſol ſi re fa*, or the chord *la ut mi fa*, I would place before the ſeventh or the ſixth a ♮ or a ♭.

In the ſame manner, if there be a flat on the cleff at *ſi*, and if I ſhould incline to mark the chord *ut mi ſol ſi*, I would place before the ſeventh a ※ or a ♮; and ſo of the reſt.

neceſſary that the note which conſtitutes the ſeventh, or diſſonance, ſhould likewiſe be found in the preceding chord.

RULE III.

193. In every chord of the ſub-dominant, at leaſt one of its conſonances muſt be found in the preceding chord. Thus, in the chord of the ſub-dominant *fa la ut re*, it is neceſſary that *fa*, *la*, or *ut*, which are the conſonances of the chord, ſhould be found in the chord preceding. The diſſonance *re* may either be found in it or not.

RULE IV.

194. Every ſimple or tonic dominant ought to deſcend by a fifth. In the firſt caſe, that is to ſay, when the dominant is ſimple, the note which follows can only be a dominant; in the ſecond it may be any one you chooſe; or, in other words, it may either be a tonic, a tonic dominant, a ſimple dominant, or a ſub-dominant. It is neceſſary, however, that the conditions preſcribed in the ſecond rule ſhould be obſerved, if it be a ſimple dominant.

This laſt reflection is neceſſary, as you will preſently ſee. For let us aſſume the ſucceſſion of the two chords *la ut✱ mi ſol*, *re fa la ut* (ſee Exam. XIX.), this ſucceſſion is by no means legitimate, though in it the firſt dominant deſcends by a fifth; becauſe the *ut* which forms the diſſonance in the ſecond chord, and which belongs to a ſimple dominant, is not in the preceding chord. But the ſucceſſion will be admiſſible, if, without meddling with the ſecond chord, one ſhould take away the ſharp carried by the *ut* in the firſt; or if, without meddling with the firſt chord, one ſhould render *ut* or *fa* ſharp in the ſecond (UU); or in ſhort, if one ſhould ſimply render the *re* of the ſecond chord a tonic dominant, in cauſing it to carry *fa✱* inſtead of *fa* natural (119. & 122.).

It is likewiſe by the ſame rule that we ought to reject the ſucceſſion of the two following chords,

re fa la ut, *ſol ſi re fa✱*;

(ſee Exam. XX.).

RULE V.

195. Every ſub-dominant ought to riſe by a fifth; and the note which follows it may, at your pleaſure, be either a tonic, a tonic dominant, or a ſub-dominant.

REMARK.

251 Other rules ſubſtituted.

Of the five fundamental rules which have now been given, inſtead of the three firſt, one may ſubſtitute the three following, which are nothing but conſequences from them, and which you may paſs unnoticed if you think it proper.

RULE I.

If a note of the fundamental baſs be a tonic, and riſe by a fifth or a third to another note, that ſecond note may be either a *tonic* (34. & 91.), ſee Examples XXI. and XXII. (XX); a *tonic dominant* (124.), ſee XXIII. and XXIV.; or a *ſub-dominant* (124.), ſee XXV. and XXVI.; or, to expreſs the rule more ſimply, that ſecond note may be any one you pleaſe, except a *ſimple dominant*.

RULE II.

If a note of the fundamental baſs be a tonic, and deſcend by a fifth or a third upon another note, this ſecond note may be either a tonic (34. & 91.), ſee Exam. XXVII. and XXVIII.; or a tonic dominant, or a ſimple dominant, yet in ſuch a manner that the rule of art. 192. may be obſerved (124.), ſee XXIX. XXX. XXXI. XXXII.; or a ſub-dominant (124.), ſee XXXIII. and XXXIV.

The procedure of the baſs *ut mi♭ ſol ut*, *fa la ut mi*, from the tonic *ut* to the dominant *fa* (Ex. XXXV.), is excluded by art. 192.

RULE III.

If a note in the fundamental baſs be a tonic, and riſe by a ſecond to another note, that note ought to be a tonic dominant, or a ſimple dominant (101. & 102.). See XXXVI. and XXXVII. (YY.)

We muſt here advertiſe our readers, that the examples XXXVIII. XXXIX. XL. XLI. belong to the fourth rule above, art. 194; and the examples XLII. XLIII. XLIV. to the fifth rule above, art. 195. See the articles 34, 35, 121, 123, 124.

REMARK I.

252 Perfect and imperfect cadences, what, and how employed.

196. The tranſition from a tonic dominant to a tonic is called an *abſolute repoſe*, or a *perfect cadence* (73.); and the tranſition from a ſub-dominant to a tonic is called an *imperfect* or *irregular cadence* (73.); the cadences are formed at the diſtance of four bars one from another, whilſt the tonic then falls within the firſt time of the bar. See XLV. and XLVI.

REMARK II.

253 Syncopation only admiſſible in the fundamental baſs by licence.

197. We muſt avoid, as much as we can, ſyncopations in the fundamental baſs; that, within the firſt time of which a bar is conſtituted, the ear may be entertained with a harmony different from that which it had

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(UU) In this chord it is neceſſary that the *ut* and *fa* ſhould be ſharp at the ſame time; for the chord *re fa la ut✱*, in which *ut* would be ſharp without the *fa*, is excluded by art. 179.

(XX) When the baſs riſes or deſcends from one tonic to another by the interval of a third, the mode is commonly changed; that is to ſay, from a major it becomes a minor. For inſtance, if I aſcend from the tonic *ut* to the tonic *mi*, the major mode of *ut*, *ut mi ſol ut*, will be changed into the minor mode of *mi*, *mi ſol ſi mi*. For what remains, we muſt never aſcend from one tonic to another, when there is no ſound common to both their modes: for example, you cannot riſe to the mode of *ut*, *ut mi ſol ut*, from the minor mode of *mi♭*, *mi♭ ſol♭ ſi♭ mi♭* (91.)

(YY) By this we may ſee, that all the intervals, viz. the third, the fifth, and ſecond, may be admitted in the fundamental baſs, except that of a ſecond in deſcending. For what remains, it is very proper to remark, that the rules immediately given for the fundamental baſs are not without exception, as approved compoſitions in muſic will certainly diſcover; but theſe exceptions being in reality licences, and for the moſt part in oppoſition to the great principle of connection, which preſcribes that there ſhould be at leaſt one note in common between a preceding and a ſubſequent chord, it does not ſeem neceſſary to entertain initiates with a minute detail of theſe licences in an elementary work, where the firſt and moſt eſſential rules of the art alone ought to be expected.

had before perceived in the laſt time of the preceding bar. Nevertheleſs, ſyncopation may be ſometimes admitted in the fundamental baſs, but it is by a licence (22).

CHAP. VII. *Of the Rules which ought to be obſerved in the Treble with relation to the Fundamental Baſs.*

254
Definition of treble.

198. The treble is nothing elſe but a modulation above the fundamental baſs, and whoſe notes are found in the chords of that baſs which correſponds with it (189.). Thus in Ex. XVIII. the ſcale *ut re mi fa ſol la ſi ut*, is a treble with reſpect to the fundamental baſs *ut ſol ut fa ut re ſol ut*.

255
One note in the treble or baſs may anſwer to ſeveral of its correſpondent parts, and why.

199. We are juſt about to give the rules for the treble; but firſt we think it neceſſary to make the two following remarks.

1. It is obvious, that many notes of the treble may anſwer to one and the ſame note in the fundamental baſs, when theſe notes belong to the chord of the ſame note in the fundamental baſs. For example, this modulation *ut mi ſol mi ut*, may have for its fundamental baſs the note *ut* alone, becauſe the chord of that note comprehends the ſounds *ut*, *mi*, *ſol*, which are found in the treble.

2. In like manner, a ſingle note in the treble may, for the ſame reaſon, anſwer to ſeveral notes in the baſs. For inſtance, *ſol* alone may anſwer to theſe three notes in the baſs, *ut ſol ut* (AAA).

RULE I. *for the Treble.*

200. If the note which forms the ſeventh in a chord of the *ſimple dominant* is found in the treble, the note which precedes it muſt be the very ſame. This is what we call a *diſcord prepared* (122). For inſtance, let us ſuppoſe that the note of the fundamental baſs ſhall be *re*, bearing the chord of the ſimple dominant *re fa la ut*; and that this *ut*, which (art. 18. and 118.) is the diſſonance, ſhould be found in the treble; it is neceſſary that the note which goes before it in the treble ſhould likewiſe be an *ut*.

201. And it is requiſite to obſerve, that, according to the rules which we have given for the fundamental baſs, *ut* will always be found in the chord of that note in the fundamental baſs which precedes the ſimple dominant *re*. See XLVIII. XLIX. L. In the firſt example the diſſonance is *ut*, in the ſecond *ſol*, and in the third *mi*; and theſe notes are already in the preceding chord (BBB).

RULE II.

202. If a note of the fundamental baſs be a tonic dominant, or a ſimple dominant, and if the diſſonance be found in the treble, this diſſonance in the ſame treble ought to deſcend diatonically. But if the note of

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(22.) There are notes which may be found ſeveral times in the fundamental baſs in ſucceſſion with a different harmony. For inſtance, the tonic *ut*, after having carried the chord *ut mi ſol ut*, may be followed by another *ut* which carries the chord of the ſeventh, provided that this chord be the chord of the tonic dominant *ut mi ſol ſi*♭. See LXXII. In the ſame manner, the tonic *ut* may be followed by the ſame tonic *ut*, which may be rendered a *ſub-dominant*, by cauſing it to carry the chord *ut mi ſol la*. See LXXIII.

A dominant, whether tonic or ſimple, ſometimes deſcends or riſes upon one another by the interval of a tritone or falſe fifth. For example, the dominant *fa*, carrying the chord *fa la ut mi*, may be followed by another dominant *ſi*, carrying the chord *ſi re fa la*. This is a licence in which the muſician indulges himſelf, that he may not be obliged to depart from the ſcale in which he is; for inſtance, from the ſcale of *ut* to which *fa* and *ſi* belong. If one ſhould deſcend from *fa* to *ſi*♭ by the interval of a juſt fifth, he would then depart from that ſcale, becauſe *ſi*♭ is no part of it.

(AAA) There are often in the treble ſeveral notes which may, if we chooſe, carry no chord, and be regarded merely as notes of paſſage, ſerving only to connect between themſelves the notes that do carry chords, and to form a more agreeable modulation. Theſe notes of paſſage are commonly quavers. See Exam. XLVII in which this modulation *ut re mi fa ſol*, may be regarded as equivalent to this other, *ut mi ſol*, as *re* and *fa* are no more than notes of paſſage. So that the baſs of this modulation may be ſimply *ut ſol*.

When the notes are of equal duration, and arranged in a diatonic order, the notes which occupy the perfect part of each time, or thoſe which are accented, ought each of them to carry chords. Thoſe which occupy the imperfect part, or which are unaccented, are no more than mere notes of paſſage. Sometimes, however, the note which occupies the imperfect part may be made to carry harmony; but the value of this note is then commonly increaſed by a point which is placed after it, which proportionably diminiſhes the continuance of the note that occupies the perfect time, and make it paſs more ſwiftly.

When the notes do not move diatonically, they ought generally all of them to enter into the chord which is placed in the lower part correſpondent with theſe notes.

(BBB) There is, however, one caſe in which the ſeventh of a ſimple dominant may be found in a modulation without being prepared. It is when, having already employed that dominant in the fundamental baſs, its ſeventh is afterwards heard in the modulation, as long as this dominant may be retained. For inſtance, let us imagine this modulation,

ut | *re ut ſi ut* | *re*;

and this fundamental baſs, *ut* | $\overset{7}{re}$ $\overset{7}{ſol}$ *ut* | $\overset{7}{ſol}$

(ſee Example LI.); the $\overset{7}{re}$ of the fundamental baſs anſwers to the two notes *re ut* of the treble. The diſſonance *ut* has no need of preparation, becauſe the note $\overset{7}{re}$ of the fundamental baſs having already been employed for the *re* which precedes *ut*, the diſſonance *ut* is afterwards preſented, below which the chord *re* may be preſerved, or *re fa la ut*.

of the baſs be a ſub dominant, it ought to riſe diatonically. This diſſonance, which riſes or deſcends diatonically, is what we have called a *diſſonance ſaved* or *reſolved* (129, 130.). See LII. LIII. LIV.

203. One may likewiſe obſerve here, that, according to the rules for the fundamental baſs which we have given, the note upon which the diſſonance ought to deſcend or riſe will always be found in the ſubſequent chord (ccc).

CHAP. VIII. *Of the Continued Baſs, and its Rules.*

256 Thorough-baſs, what.

204. A CONTINUED * or thorough baſs, is nothing elſe but a fundamental baſs whoſe chords are *inverted.* We invert a chord when we change the order of the notes which compoſe it. For example, if inſtead of the chord *ſol ſi re fa*, I ſhould ſay *ſi re fa ſol* or *re fa ſol ſi*, &c. the chord is inverted. Let us ſee then, in the firſt place, all the poſſible ways in which a chord may be inverted.

257 Chords inverted, how.

* See Continued baſs.

The ways in which a PERFECT CHORD may be INVERTED.

205. The perfect chord *ut mi ſol ut* may be inverted in two different ways.

1. *Mi ſol ut mi*, which we call a chord of the *ſixth*, compoſed of a third, a ſixth, and an octave, and in this caſe the note *mi* is marked with a 6. (See LVI.)

2. *Sol ut mi ſol*, which we call a *chord of the ſixth and fourth*, compoſed of a fourth, a ſixth, and an octave; and it is marked with a $\frac{6}{4}$. (See LVII.)

The perfect minor chord is inverted in the ſame manner.

The ways in which the CHORD of the SEVENTH may be INVERTED.

206. In the chord of the tonic dominant, as *ſol ſi re fa*, the third major *ſi* above the fundamental note *ſol* is called a *ſenſible note* (77.); and the inverted chord *ſi re fa ſol*, compoſed of a third, a falſe fifth, and ſixth, is called the *chord of the falſe fifth*, and is marked with an 8 or a ♭ 5 (ſee LVIII. and LIX.)

The chord *re fa ſol ſi*, compoſed of a third, a fourth, and a ſixth, is called the *chord of the ſenſible ſixth*, and marked with a 6 or a ※6. In this chord thus figured, the third is minor, and the ſixth major, as it is eaſy to be perceived. (See LX.)

The chord *fa ſol ſi re*, compoſed of a ſecond, a tritone, and a ſixth, is called the *chord of the tritone*, and is marked thus 4+, thus ×4, or thus ※4. (See LXI.)

207. In the chord of the ſimple dominant *re fa la ut*, we find,

1. *Fa la ut re*, a chord of the great ſixth, which is compoſed of a third, a fifth, and a ſixth, and which is figured with a $\frac{6}{5}$. See LXIII. (DDD).

2. *La ut re fa*, a chord of the leſſer ſixth, which is figured with a 6. See LXIV. (EEE).

3. *Ut re fa la*, a chord of the ſecond, compoſed of a ſecond, a fourth, and a ſixth, and which is marked with a 2. See LXII. (FFF).

The ways in which the CHORD of the ſub-DOMINANT may be inverted.

208. The chord of the ſub-dominant, as *fa la ut re*, may be inverted in three different manners; but the method of inverting it which is moſt in practice is the chord of the leſſer ſixth *la ut re fa*, which is marked with a 6, and the chord of the ſeventh *re fa la ut*. See LXIV.

RULES for the CONTINUED BASS.

209. The continued baſs is a fundamental baſs, whoſe chords are only inverted in order to render it more in the taſte of ſinging, and ſuitable to the voice. See LXV. in which the fundamental baſs which in itſelf is monotonic and little ſuited for ſinging, *ut ſol ut ſol ut ſol ut*, produces, by inverting its chords, this continued

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(CCC) When the treble ſyncopates in deſcending diatonically, it is common enough to make the ſecond part of the ſyncope carry a diſcord, and the firſt a concord. See *Example* LV. where the firſt part of the ſyncopated note *ſol* is in concord with the notes *ut mi ſol ut*, which anſwer to it in the fundamental baſs, and where the ſecond part is a diſſonance in the ſubſequent chord *la ut mi ſol.* In the ſame manner, the firſt part of the ſyncopated note *fa* is in concord with the notes *re fa la ut*, which anſwer to it; and the ſecond part is a diſſonance in the ſubſequent chord *ſol ſi re fa*, which anſwer to it, &c.

(DDD) We are obliged to mark likewiſe, in the continued baſs, the chord of the ſub-dominant with a $\frac{6}{5}$, which in the fundamental baſs is figured with a 6 alone; and this to diſtinguiſh it from the chords of the ſixth and of the leſſer ſixth. (See Examples LVI. and LXIV.) For what remains, the chord of the great ſixth in the fundamental baſs carries always the ſixth major, whereas in the continued baſs it may carry the ſixth minor. For inſtance, the chord of the ſeventh *ut mi ſol ſi*, gives the chord of the great ſixth *mi ſol ſi ut*, thus improperly called, ſince the ſixth from *mi* to *ut* is minor.

(EEE) M. Rameau has juſtly obſerved, that we ought rather to figure this leſſer ſixth with a $\frac{3}{4}$, to diſtinguiſh it from the ſenſible ſixth which ariſes from the chord of the tonic dominant, and from the ſixth which ariſes from the perfect chord. In the mean time he figures in his works with a 6 alone, the leſſer ſixths which do not ariſe from the tonic dominant; that is to ſay, he figures them as thoſe which ariſe from the perfect chord; and we have followed him in that, though we thought with him, that it would be better to mark this chord by a particular figure.

(FFF) The chord of the ſeventh *ſi re fa la* gives, when inverted, the chord *fa la ſi re*, compoſed of a third, a tritone, and a ſixth, This chord is commonly marked with a 6, as if the tritone were a juſt fourth. It is his buſineſs who performs the accompaniment, to know whether the fourth above *fa* be a tritone or a fourth redundant. One may, as to what remains, figure this chord thus $\begin{smallmatrix}6\\4^{*}\\3\end{smallmatrix}$.

tinued baſs highly proper to be ſung, *ut ſi ut re mi fa mi*, &c. (GGG)

The continued baſs then is properly nothing elſe but a treble with reſpect to the fundamental baſs. Its rules immediately follow, which are properly no other than thoſe already given for the treble.

Rule I.

210. Every note which carries the chord of the falſe fifth, and which of conſequence muſt be what we have called a *ſenſible note*, ought (77) to riſe diatonically upon the note which follows it. Thus in example LXV. the note *ſi*, carrying the chord of the falſe fifth marked with an 8, riſes diatonically upon *ut* (HHH).

Rule II.

211. Every note carrying the chord of the tritone ſhould deſcend diatonically upon the ſubſequent note. Thus in the ſame example LXV. *fa*, which carries the chord of the tritone figured with a 4+, deſcends diatonically upon *mi*. (Art. 202.)

Rule III.

212. The chord of the ſecond is commonly put in practice upon notes which are ſyncopated in deſcending, becauſe theſe notes are diſſonances which ought to be prepared and reſolved (200, 202.) See the example LXVI. where the ſecond *ut*, which is ſyncopated, and which deſcends afterwards upon *ſi*, carries the chord of the ſecond (III).

Chap.

(GGG) The continued baſs is proportionably better adapted to ſinging, as the ſounds which form it more ſcrupulouſly obſerve the diatonic order, becauſe this order is the moſt agreeable of all. We muſt therefore endeavour to preſerve it as much as poſſible. It is for this reaſon that the continued baſs in Example LXV. is much more in the taſte of ſinging, and more agreeable, than the fundamental baſs which anſwers to it.

(HHH) The continued baſs being a kind of treble with relation to the fundamental baſs, it ought to obſerve the ſame rules with reſpect to that baſs as the treble. Thus a note, for inſtance *re*, carrying a chord of the ſeventh *re fa la ut*, to which the chord of the ſub-dominant *fa la ut re* correſponds in the fundamental baſs, ought to riſe diatonically upon *mi*, (art. 129, n° 2. and art. 202.)

(III) When there is a *repoſe* in the treble, the note of the continued baſs ought to be the ſame with that of the fundamental baſs, (ſee example LXVII.) In the cloſes which are found in the treble at *ſi* and *ut* (bars third and fourth), the notes in the fundamental and continued baſs are the ſame, viz. *ſol* for the firſt cadence, and *ut* for the ſecond. This rule ought above all to be obſerved in final cadences which terminate a piece or a modulation.

It is neceſſary, as much as poſſible, to prevent coincidences of the ſame notes in the treble and continued baſs, unleſs the motion of the continued baſs ſhould be contrary to that of the treble. For example, in the ſecond note of the ſecond bar in example LXVII. *mi* is found at the ſame time in the continued baſs and in the treble; but the treble deſcends from *fa* to *mi*, whilſt the baſs riſes from *re* to *mi*.

Two octaves, or two fifths, in ſucceſſion, muſt likewiſe be ſhunned. For inſtance, in the treble ſounds *ſol mi*, the baſs muſt be prevented from ſounding *ſol mi*, *ut la*, or *re ſi*, becauſe in the firſt caſe there are two octaves in ſucceſſion, *ſol* againſt *ſol*, and *mi* againſt *mi*; and becauſe in the ſecond caſe there are two fifths in ſucceſſion, *ut* againſt *ſol*, and *la* againſt *mi*, or *re* againſt *ſol*, and *ſi* againſt *mi*. This rule, as well as the preceding, is founded upon this principle, that the continued baſs ought not to be a copy of the treble, but to form a different melody.

Every time that ſeveral notes of the continued baſs anſwer to one note alone of the fundamental, the compoſer ſatisfies himſelf with figuring the firſt of them. Nay he does not even figure it if it be a tonic; and he draws above the others a line, continued from the note upon which the chord is formed. See example LXVIII. where the fundamental baſs *ut* gives the continued baſs *ut mi ſol mi*; the two *mi*'s ought in this baſs to carry the chord 6, and *ſol* the chord $\genfrac{}{}{0pt}{}{6}{4}$: but as theſe chords are comprehended in the perfect chord *ut mi ſol ut*, which is the firſt of the continued baſs, we place nothing above *ut*, only we draw a line over *ut mi ſol mi*.

In like manner, in the ſecond bar of the ſame example, the notes *fa* and *re* of the continued baſs, riſing from the note *ſol* alone of the fundamental baſs which carries the chord *ſol ſi re fa*, we think it ſufficient to figure *fa* with the number of the tritone 4×, and to draw a line above *fa* and *re*.

It ſhould be remarked, that this *fa* ought naturally to deſcend to *mi*; but this note is conſidered as ſubſiſting ſo long as the chord ſubſiſts; and when the chord changes, we ought neceſſarily to find the *mi*, as may be ſeen by that example.

In general, whilſt the ſame chord ſubſiſts in paſſing through different notes, the chord is reckoned the ſame as if the firſt note of the chord had ſubſiſted; in ſuch a manner, that, if the firſt note of the chord is, for inſtance, the ſenſible note, we ought to find the tonic when the chord changes. See example LXIX. or this continued baſs, *ut ſi ſol ſi re ut*, is reckoned the ſame with this *ut ſi ut*. (Example LXX.)

If a ſingle note of the continued baſs anſwers to ſeveral notes of the fundamental baſs, it is figured with the different chords which agree to it. For example, the note *ſol* in a continued baſs may anſwer to this fundamental baſs *ut ſol ut*, (ſee example LXXI.); in this caſe, we may regard the note *ſol* as divided into three parts, of which the firſt carries the chord $\genfrac{}{}{0pt}{}{6}{4}$, the ſecond the chord 7, and the third the chord $\genfrac{}{}{0pt}{}{6}{4}$.

We ſhall repeat here, with reſpect to the rules of the continued baſs, what we have formerly ſaid concerning the rules of the fundamental baſs in the note upon the third rule, art. 193. The rules of the continued baſs have exceptions, which practice and the peruſal of good authors will teach. There are likewiſe ſeveral other rules which might require a conſiderable detail, and which will be found in the *Treatiſe of Harmony* by M. Rameau, and elſewhere. Theſe rules, which are proper for a complete diſſertation, did not appear to me indiſpenſably neceſſary in an *elementary eſſay upon muſic*, ſuch as the preſent. The books which we have quoted at the end of our *preliminary diſcourſe* will more particularly inſtruct the reader concerning this practical detail.

Principles of Compoſition.

CHAP. IX. *Of ſome Licences aſſumed in the Fundamental Baſs.*

§ 1. *Of Broken and Interrupted Cadences.*

258 Broken cadence, how executed.

213. The broken cadence is executed by means of a dominant which riſes diatonically upon another, or upon a tonic by a licence. See, in the example LXXIV. *ſol la*, (172, and 134).

259 Interrupted cadence, how formed.

214. The interrupted cadence is formed by a dominant which deſcends by a third upon another (136). See, in the example LXXV. *ſol mi* (LLL).

Theſe cadences ought to be permitted but rarely and with precaution.

§ 2. *Of Supposition.*

260 Chord by ſuppoſition, what.

215. When a dominant is preceded by a tonic in the fundamental baſs, we add ſometimes, in the continued baſs to the chord of that dominant, a new note which is a third or fifth below; and the chord which reſults from it in this continued baſs is called *a chord by ſuppoſition*.

See Suppoſition.

For example, let us ſuppoſe, that in the fundamental baſs we have a dominant *ſol* carrying the chord of the ſeventh *ſol ſi re fa*; let us add to this chord the note *ut*, which is a fifth below this dominant, and we ſhall have the total chord *ut ſol ſi re fa*, or *ut re fa ſol ſi*. which is called *a chord by ſuppoſition* (MMM.)

Of the different kinds of chords by ſuppoſition.

216. It is eaſy to perceive, that chords by ſuppoſition are of different kinds. For inſtance, the chord of the tonic *ſol ſi re fa* gives,

261 Theſe different chords what and how figured.

1. By adding the fifth *ut*, the chord *ut ſol ſi re fa*, called a *chord of the ſeventh redundant*, and compoſed of a fifth, ſeventh, ninth, and eleventh. It is figured with a ※ 7; ſee LXXVI. (NNN). This chord is not practiſed but upon the tonic. They ſometimes leave out the ſenſible note, for reaſons which we ſhall give in the note QQQ, upon the art. 219; it is then reduced to *ut fa ſol re*, and marked with $\frac{5}{4}$ or $\frac{5}{2}$.

2. By adding the third *mi*, we ſhall have the chord *mi ſol ſi re fa*, called a *chord of the ninth*, and compoſed of a third, fifth, ſeventh, and ninth. It is figured with a 9. This third may be added to every third of the dominant. See LXXVII. (OOO).

3. If to a chord of the ſimple dominant, as *re fa la ut*, we ſhould add the fifth *ſol*, we would have the chord *ſol re fa la ut*, called a *chord of the eleventh*, and which is figured with a $\frac{9}{4}$ or $\frac{4}{9}$. (See LXXVIII.)

OBSERVE.

262 Occaſions when retrenchments of chords are proper.

217. WHEN the dominant is not a tonic dominant, they often take away ſome notes from the chord. For example, let us ſuppoſe that there is in the fundamental baſs this ſimple dominant *mi*, carrying the chord *mi ſol ſi re*: if there ſhould be added the third *ut* beneath, we ſhall have this chord of the continued baſs *ut mi ſol ſi re*, but they ſuppreſs the ſeventh *ſi*, for reaſons which ſhall be explained in the note QQQ upon art.

(LLL) One may ſometimes, but very rarely cauſe ſeveral tonics in ſucceſſion to follow one another in aſcending or deſcending diatonically, as *ut mi ſol ut*, *re fa la re*, *ſi♭ re fa ſi♭*; but, beſides that this ſucceſſion is harſh, it is neceſſary, in order to render it practicable, that the fifth below the firſt tonic ſhould be found in the chord of the tonic following, as here *fa*, a fifth below the firſt tonic *ut*, is found in the chord *re fa la re*, and in the chord *ſi♭ re fa ſi♭* (37 and note G.)

(MMM) Though ſuppoſition be a kind of licence, yet it is in ſome meaſure founded on the experiment related in the note (F), where you may ſee that every principal or fundamental ſound cauſes its twelfth and ſeventeenth major in deſcending to vibrate, whilſt the twelfth and the ſeventeenth major aſcending reſound: which ſeems to authorize us in certain caſes to join with the fundamental harmony this twelfth and ſeventeenth in deſcending; or, which is the ſame thing, the fifth or the third beneath the fundamental ſound.

Even without having recourſe to this experiment, we may remark, that the note added beneath the fundamental ſound, cauſes that very fundamental ſound to be heard. For inſtance; *ut* added beneath *ſol*, cauſes *ſol* to reſound. Thus *ſol* is found in ſome meaſure to be implied in *ut*.

If the third added beneath the fundamental ſound be minor, for example, if to the chord *ſol ſi re fa*, we add the third *mi*, the ſuppoſition is then no longer founded on the experiment, which only gives the ſeventeenth major, or, what is the ſame thing, the third major beneath the fundamental ſound. In this caſe the addition of the third minor muſt be conſidered as an extenſion of the rule, which in reality has no foundation in the chords emitted by a ſonorous body, but is authorized by the ſanction of the ear and by practical experiment.

(NNN) Many muſicians figure this chord with a ※ $\frac{7}{2}$; M. Rameau ſuppreſſes this 2, and merely marks it to be the ſeventh redundant by a 7※ or ※7. But it may be ſaid, how ſhall we diſtinguiſh this chord from the ſeventh major, which, as it would ſeem, ought to be marked with a 7※? M. Rameau anſwers, that there is no danger of miſtake, becauſe in the ſeventh major, as the ſeventh ought to be prepared, it is found in the preceding chord; and thus the ſharp ſubſiſting already in the preceding chord, it would be uſeleſs to repeat it.

Thus $\overset{\overset{7}{※}}{re}$ *ſol*, according to M. Rameau, would indicate *re fa※ la ut*, *ſol ſi re fa※*. If we would change *fa※* of the ſecond chord into *fa*, it would then be neceſſary to write $\overset{\overset{7}{※}}{re}$ $\overset{7♮}{ſol}$. In notes ſuch as *ut*, whoſe natural ſeventh is major, the figure 7 preceded or followed by a ſharp will ſufficiently ſerve to diſtinguiſh the chord of the ſeventh redundant *ut ſol ſi re fa*, from the ſimple chord of the ſeventh *ut mi ſol ſi*, which is marked with a 7 alone. All this appears juſt and well founded.

(OOO) Suppoſition introduces into a chord diſſonances which were not in it before. For inſtance, if to the chord *mi ſol ſi re*, we ſhould add the note of ſuppoſition *ut* deſcending by a third, it is plain that, beſides the diſſonance art. 219. In this ſtate the chord is ſimply compoſed of a third, fifth, and ninth, and is marked with a 9. See LXXIX. (PPP)

218. What is more, in the chord of the ſimple dominat, as *re fa la ut*, when the fifth *ſol* is added, they frequently obliterate the ſounds *fa* and *la*, that too great a number of diſſonances may be avoided, which reduces the chord to *ſol ut re*. This laſt is compoſed only of the fourth and the fifth. It is called a *chord of the fourth*, and it is figured with a 4. (See LXXX.)

219. Sometimes they only remove the note *la*, and then the chord ought to be figured with $^{7}_{4}$ or $^{4}_{7}$ (QQQ).

263
Chord of the fifth redundant what, and how figured.

220. Finally, in the minor mode, for example, in that of *la*, where the chord of the tonic dominant (109,) is *mi ſol※ ſi re* ; if we add to this chord the third *ut* below, we ſhall have *ut mi ſol※ ſi re*, called the *chord of the fifth redundant*, and compoſed of a third, a fifth redundant, a ſeventh, and a ninth. It is figured with a ※5 or a +5. See LXXXI. (RRR.)

§ 3. *Of the* CHORD *of the* DIMINISHED SEVENTH.

264
Chord of the flat ſeventh what, and how figured.

221. In the minor mode, for inſtance, in that of *la mi* a fifth from *la* is the tonic dominant (109), and carries the chord *mi ſol※ ſi re*, in which *ſol* is the ſenſible note. For this chord they ſometimes ſubſtitute that other *ſol※ ſi re fa* (116), all compoſed of minor thirds ; and which has for its fundamental ſound the ſenſible note *ſol※*. This chord is called a *chord of the flat, or diminiſhed ſeventh*, and is figured with a $\dot{7}$ in the fundamental baſs, (ſee LXXXII.) : but it is always conſidered as repreſenting the chord of the tonic dominant.

265
Chords produced in the continued baſs by this what, and how figured.

222. This chord in the fundamental baſs produces in the continued baſs the following chords :

1. The chord *ſi re fa ſol※*, compoſed of a third, falſe fifth, and ſixth major. They call it the *chord of the ſixth ſenſible and falſe fifth* ; and it is figured thus ※ $^{6}_{3}$, or + $^{6}_{8}$. (See LXXXIII).

2. The chord *re fa ſol※ ſi*, compoſed of a third, a tritone, and a ſixth, they call it the *chord of the tritone and third minor* ; and they mark it thus ※ $\overset{4}{6}$. (See LXXXIV.)

3. The chord *fa ſol※ ſi re*, compoſed of a ſecond redundant, a tritone, and a ſixth. They call it the *chord of the ſecond redundant*, and they figure it thus ※2, or +2. See LXXXV. (SSS).

266
Alterations by ſuppoſition, chords which they produce what, and how figured.

223. Beſides, ſince the chord *ſol※ ſi re fa* repreſents the chord *mi ſol※ ſi re*, it follows, that if we operate by ſuppoſition upon the firſt of theſe chords, it muſt be performed as one would perform it upon *mi*

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diſſonance between *mi* and *re* which was in the original chord, we have two new diſſonances, *ut ſi*, and *ut re* ; that is to ſay, the ſeventh and the ninth. Theſe diſſonances, like the others, ought to be prepared and reſolved. They are prepared by being ſyncopated, and reſolved by deſcending diatonically upon one of the conſonances of the ſubſequent chord. The ſenſible note alone can be reſolved in aſcending ; but it is even neceſſary that this ſenſible note ſhould be in the chord of the tonic dominant. As to the diſſonances which are found in the primitive chord, they ſhould always follow the common rules. (See art. 202.)

(PPP) Several muſicians call this laſt chord the *chord of the ninth* ; and that which, with M. Rameau, we have ſimply called a *chord of the ninth*, they term a *chord of the ninth and ſeventh*. This laſt chord they mark with a $^{9}_{7}$; but the denomination and figure uſed by M. Rameau are more ſimple, and can lead to no error ; becauſe the chord of the ninth always includes the ſeventh, except in caſes of which we have already ſpoken.

(QQQ) They often remove ſome diſſonances from chords of ſuppoſition, either to ſoften the harſhneſs of the chord, or to remove diſcords which can neither be prepared nor reſolved. For inſtance, let us ſuppoſe, that in the continued baſs the note *ut* is preceded by the ſenſible note *ſi*, carrying the chord of the falſe fifth, and that we ſhould chooſe to form upon this note *ut* the chord *ut mi ſol* $\underset{8}{\textit{ſi}}$ *re*, we muſt obliterate the ſeventh *ſi*, becauſe in retaining it we ſhould deſtroy the effect of the ſenſible note *ſi*, which ought to riſe to *ut*.

In the ſame manner, if to the harmony of a tonic dominant *ſol ſi re fa*, one ſhould add the note by ſuppoſition *ut*, it is uſual to retrench from this chord the ſenſible note *ſi* ; becauſe, as the *re* ought to deſcend diatonically to *ut*, and the *ſi* to riſe to it, the effect of the one would deſtroy that of the other. This above all takes place in the *ſuſpence*, concerning which we ſhall preſently treat.

(RRR). *Suppoſition* produces what we call *ſuſpence* ; and which is almoſt the ſame thing. Suſpenſion conſiſts in retaining as many as poſſible of the ſounds in a preceding chord, that they may be heard in the chord which ſucceeds. For inſtance, if this fundamental baſs be given *ut* $\overset{7}{\textit{ſol}}$ *ut*, and this continued baſs above it *ut* $\overset{※7}{\textit{ut}}$ *ut*, it is a ſuppoſition ; but if we have this fundamental baſs *ut* $\overset{7}{\textit{ſol}}$ $\overset{7}{\textit{ſol}}$ *ut*, and this continued baſs above it *ut* $\overset{-}{\textit{ſol}}$ $\overset{※7}{\textit{ut}}$ *ut*, it is a ſuſpence ; becauſe the perfect chord of *ut*, which we naturally expect after *ſol* in the continued baſs, is *ſuſpended* and *retarded* by the chord $\overset{※7}{\textit{ut}}$, which is formed by retaining the ſounds *ſol ſi re fa* of the preceding chord to join them to the note *ut* in this manner, *ut ſol ſi re fa* ; but this chord $\overset{※7}{\textit{ut}}$ does nothing in this caſe but *ſuſpend* for a moment the perfect chord *ut mi ſol ut*, which ought to follow it.

(SSS) The chord of the diminiſhed ſeventh, ſuch as *ſol※ ſi re fa*, and the three derived from it, are termed *chords of ſubſtitution*. They are in general harſh, and proper for imitating melancholy objects.

mi ſol※ *ſi re*: that is to ſay, that it will be neceſſary to add to the chord *ſol*※ *ſi re fa*, the notes *ut* or *la*, which are the third or fifth below *mi*, and which will produce,

1. By adding *ut*, the chord *ut ſol*※ *ſi re fa*, compoſed of a fifth redundant, a ſeventh, a ninth, and eleventh, which is the octave of the fourth. It is called a *chord of the fifth redundant and fourth*, and thus marked $+{}^{5}_{4}$, or ※${}^{5}_{4}$. (See LXXXVI.)

2. By adding *la*, we ſhall have the chord *la ſol*※ *ſi re fa*, compoſed of a ſeventh redundant, a ninth, an eleventh, and a thirteenth minor, which is the octave of the fixth minor. It is called the *chord of the ſeventh redundant and fixth minor*, and marked ♭$\overset{7}{6}$, or ※$\overset{7}{\flat}$. (See LXXXVII.) It is of all chords the moſt harſh, and the moſt rarely practiſed (TTT).

In the *Treatiſe of Harmony* by M. Rameau, and elſewhere, may be ſeen a much longer detail of the chords by ſuppoſition: But here we delineate the elements alone.

Chap. X. *Of ſome Licences uſed in the Treble and Continued Baſs.*

267 Licence 1ſt.

224. Sometimes in a treble, the diſſonance which ought to have been reſolved by deſcending diatonically upon the ſucceeding note, inſtead of deſcending, on the contrary riſes diatonically: but in that caſe, the note upon which it ought to have deſcended muſt be found in ſome of the other parts. This licence ought to be rarely practiſed.

In like manner, in a continued baſs, the diſſonance in a chord of the ſub-dominant inverted, as *la* in the chord *la ut mi ſol*, inverted from *ut mi ſol la*, may ſometimes deſcend diatonically inſtead of riſing as it ought to do, art. 129. n° 2.; but in that caſe the note ought to be repeated in another part, that the diſſonance may be there reſolved in aſcending.

268 Licence 2d.

225. Sometimes likewiſe, to render a continued baſs more agreeable by cauſing it to proceed diatonically, they place between two ſounds of that baſs a note which belongs to the chord of neither. See example XCIV, in which the fundamental baſs *ſol ut* produces the continued baſs *ſol la ſi ſol ut*, where *la* is added on account of the diatonic modulation. This *la* has a line drawn above it to ſhow its reſolution by paſſing under the chord *ſol ſi re fa*.

In the ſame manner, (ſee XCV), this fundamental baſs *ut fa* may produce the continued baſs *ut re mi ut fa*, where the note *re* which is added paſſes under the chord *ut mi ſol ut*.

Chap. XI. *Containing the Method of finding the Fundamental Baſs when the Continued Baſs is figured.*

269 How to find the fundamental baſs when the continued baſs is figured.

226. To exerciſe yourſelf with greater eaſe in finding the fundamental baſs, and to render it more familiar to you, it is neceſſary to obſerve how eminent maſters, and above all how M. Rameau has put the rules in practice. Now, as they never place any thing but the continued baſs in their works, it becomes then neceſſary to know how to find the fundamental baſs when the continued baſs is figured. This problem may be eaſily ſolved by the following rules.

227. 1. Every note which has no figure in the continued baſs, ought to be the ſame, and without a figure in the fundamental baſs; it either is a tonic, or reckoned ſuch, (UUU).

2. Every note which in the continued baſs carries a 6, ought in the fundamental baſs to give its third below not figured,* or its fifth below marked with a 7. We ſhall diſtinguiſh theſe two caſes below. (See LVI. and LXIV, and the note ZZZ).

* See Figured.

3. Every note carrying ${}^{6}_{4}$ gives in the fundamental baſs its fifth below not figured. (See LVII.)

4. Every note figured with a 7 or a $\dot{7}$, is the ſame in both baſſes, and with the ſame figure (XXX).

5. Every note figured with a 2 gives in the fundamental baſs the diatonic note above figured with a 7. See LXII. (YYY).

6. Every note marked with a 4 gives in the fundamental

(TTT) As the chord of the diminiſhed ſeventh *ſol*※ *ſi re fa*, and the chord of the tonic dominant *mi ſol*※ *ſi re*, only differ one from the other by the notes *mi* and *fa*; one may form a diatonic modulation of theſe two notes, and then the fundamental baſs does nothing but paſs from the tonic dominant to the ſenſible note, and from that note to the tonic dominant, till it arrives at the tonic. (See XCII.)

For the ſame reaſon, as the chord of the diminiſhed ſeventh *ſol*※ *ſi re fa*, and the chord *ſi re fa la*, which carries the fifth *ſi* of the tonic dominant *mi*, only differs by the ſenſible note *ſol*※, and the tonic *la*; one may ſometimes, while the treble modulates *ſol*※ *la ſol*※ *la ſol*※ *la*, aſcend in the fundamental baſs, from the baſs note to the third above, provided one deſcend at laſt from thence to the tonic dominant, and from thence to the tonic; (ſee XCIII.) As to what remains, this and the preceding examples are licences.

(UUU) I ſay a tonic, or *reckoned ſuch*, becauſe it may perhaps be a dominant from which the diſſonance has been removed. But in that caſe one may know that it is a real dominant by the note which precedes it. For inſtance, if the note *ſol*, carrying a perfect chord, is preceded by *re* a ſimple dominant, carrying the chord *re fa la ut*, that note *ſol* is not a real tonic; becauſe, in order to this, it would have been neceſſary that *re* ſhould have been a tonic dominant, and ſhould have carried the chord *re fa*※ *la ut*; and that a ſimple dominant, as *re*, carrying the chord *re fa la ut*, ſhould only naturally deſcend to a dominant, (art. 194.)

(XXX) Sometimes a note which carries a 7 in the continued baſs, gives in the fundamental baſs its third above, figured with a 6. For example, this continued baſs $\overset{7}{la}$ $\overset{8}{ſi}$ *ut* gives this fundamental baſs $\overset{6}{ut}$ $\overset{7}{ſol}$ *ut*; but in this caſe it is neceſſary that the note figured with a 6 ſhould riſe by a fifth, as we ſee here *ut* riſe to *ſol*.

(YYY) A note figured with a 2, gives likewiſe ſometimes in the fundamental baſs its fourth above, figured with mental baſs the diatonic note above, figured with a 7. (See LXI.)

7. Every note figured with an 8 gives its third below figured with a 7. (See LVIII.)

8. Every note marked with a 6 gives the fifth below marked with a 7; (ſee LX.) and it is plain by art. 187, that in the chord of the ſeventh, of which we treat in theſe three laſt articles, the third ought to be major, and the ſeventh minor, this chord of the ſeventh being the chord of the tonic dominant. (See art, 102.)

9. Every note marked with a 9 gives its third above figured with a 7. (See LXXVII and LXXIX.)

10. Every note marked with a $\substack{9\\4}$ gives the fifth above figured with a 7. (See LXXVIII.)

11. Every note marked with a ※ 5, or with a + 5, gives the third above figured with a $\overset{7}{※}$. (See LXXXI.)

12. Every note marked with a ※ 7 gives a fifth above figured with a 7, or with a $\overset{7}{※}$. (See LXXVI.) It is the ſame caſe with the notes marked $\substack{7\\4}$, $\substack{5\\4\\2}$, or $\substack{5\\2}$: which ſhows a retrenchment, either in the complete chord of the eleventh, or in that of the ſeventh redundant.

13. Every note marked with a 4 gives a fifth above figured with a 7, or a $\overset{7}{※}$. (See LXXX.)

14. Every note marked with a ※ $\substack{6\\3}$ gives the third minor below, figured with a $\dot{7}$. (See LXXXIII.)

15. Every note marked with a ※$\overset{4}{\flat}$ gives the tritone above figured with a $\dot{7}$. (See LXXXIV.)

16. Every note marked with a + 2 gives the ſecond redundant above, figured with a $\dot{7}$. (See LXXXV.)

17. Every note marked with a ※ $\substack{5\\4}$ gives the fifth redundant above, figured with a $\dot{7}$. (See LXXXVI.)

18. Every note marked with a $\substack{※7\\ \flat 6}$ gives the ſeventh redundant above, figured with a $\dot{7}$. See LXXXVII. (zzz).

Remark.

270
A difficulty in finding the fundamental baſs.

228. We have omitted two caſes, which may cauſe ſome uncertainty.

The firſt is that where the note of the continued baſs is figured with a 6. We now preſent the reaſon of the difficulty.

Suppoſe we ſhould have the dominant $\overset{7}{re}$ in the fundamental baſs, the note which anſwers to it in the continued baſs may be *la* carrying the figure 6 (ſee LXIV.); that is to ſay, the chord *la ut re fa*: now if we ſhould have the ſub-dominant $\overset{6}{fa}$ in the fundamental

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with a 6; but it is neceſſary in that caſe that the note figured with a 6, may even here riſe to a fifth. (See note xxx).

Theſe variations in the fundamental baſs, as well in the chord concerning which we now treat, as in the chord figured with a 7, and in two others which ſhall afterwards be mentioned (art. 228 and 229), are cauſed by a deficiency in the ſigns proper for the chord of the ſub-dominant, and for the different arrangements by which it is inverted.

M. l'Abbe Rouſſier, to redreſs this deficiency, had invented a new manner of figuring the continued baſs. His method is moſt ſimple for thoſe who know the fundamental baſs. It conſiſts in expreſſing each chord by only ſignifying the fundamental ſound with that letter of the ſcale by which it is denominated, to which is joined a 7 or $\dot{7}$, or a 6, in order to mark all the diſcords. Thus the fundamental chord of the ſeventh *re fa la ut* is expreſſed by a $\overset{7}{D}$; and the ſame chord, when it is inverted from that of the ſub-dominant *fa la ut re*, is characterized by $\overset{6}{F}$; the chord of the ſecond *ut re fa la*, inverted from the dominant *re fa la ut*, is likewiſe repreſented by $\overset{7}{D}$; and the ſame chord *ut re fa la* inverted from that of the ſub-dominant *fa la ut re* is ſignified by F; the caſe is the ſame when the chords are differently inverted. By this means it would be impoſſible to miſtake either with reſpect to the fundamental baſs of a chord, or with reſpect to the note which forms its diſſonance, or with reſpect to the nature and ſpecies of that diſcord.

(zzz) We may only add, that here and in the preceding articles, we ſuppoſe, that the continued baſs is figured in the manner of M. Rameau. For it is proper to obſerve, that there are not, perhaps, two muſicians who characteriſe their chords with the ſame figures; which produces a great inconveniency to the perſon who plays the accompaniments: but here we do not treat of accompaniments. For every reaſon, then, we ſhould adviſe initiates to prefer the continued baſſes of M. Rameau to all the others, as by them they will moſt ſucceſsfully ſtudy the fundamental baſs.

It is even neceſſary to advertiſe the reader, and I have already done it (note EEE), that M. Rameau only marks the leſſer ſixth by a 6 without a line, when this leſſer ſixth does not reſult from the chord of the tonic dominant; in ſuch a manner that the 6 renders it uncertain whether in the fundamental baſs we ought to chooſe the third or the fifth below: but it will be eaſy to ſee whether the third or the fifth is ſignified by that figure. This may be diſtinguiſhed, 1. In obſerving which of the two notes is excluded by the rules of the fundamental baſs. 2. If the two notes may with equal propriety be placed in the fundamental baſs, the preference muſt be determined by the tone or mode of the treble in that particular paſſage. In the following chapter we ſhall give rules for determining the mode.

There is a chord of which we have not ſpoken in this enumeration, and which is called the *chord of the ſixth redundant*. The chord is compoſed of a note, of its third major, of its redundant fourth or tritone, and its redundant ſixth, as *fa la ſi re※*. It is marked with a 6※. It appears difficult to find a fundamental baſs for this chord; nor is it indeed much in uſe amongſt us. (See the note upon the art. 115.)

mental baſs, this ſub-dominant might produce in the continued baſs the ſame note *la* figured with a 6. When therefore one finds in the continued baſs a note marked with a 6, it appears at firſt uncertain whether we ſhould place in the fundamental baſs the fifth below marked with a 7, or the third below marked with a 6.

271 Another.

229. The ſecond caſe is that in which the continued baſs is figured with a $^{6}_{5}$. For inſtance, if there ſhould be found $\overset{\substack{6\\5}}{fa}$ in the continued baſs, one may be ignorant whether he ought to inſert in the fundamental baſs *fa* marked with a 6, or *re* figured with a 7.

272 Solution.

230. You may eaſily extricate yourſelf from this little difficulty, in leaving for an inſtant this uncertain note in ſuſpence, and in examining what is the ſucceeding note of the fundamental baſs; for if that note be in the preſent caſe a fifth above *fa*, that is to ſay, if it is *ut*, in this caſe, and in this alone, he may place $\overset{6}{fa}$ in the fundamental baſs. It is a conſequence of this rule, that in the fundamental baſs every ſub-dominant ought to riſe by a fifth (195).

Chap. XII. *What is meant by being in a Mode or Tone.*

273 Method of determining the mode in which we are.

231. In the firſt part of this treatiſe (chap. vi.), we have explained, how by the means of the note *ut*, and of its two fifths *ſol* and *fa*, one in aſcending, which is called a *tonic dominant*, the other in deſcending, which is called a *ſub-dominant*, the ſcale *ut re mi fa ſol la ſi ut* may be found: the different ſounds which form this ſcale compoſe what we call the *major mode* of *ut*, becauſe the third *mi* above *ut* is major. If therefore we would have a modulation in the major mode of *ut*, no other ſounds muſt enter into it than thoſe which compoſe this ſcale; in ſuch a manner that if, for inſtance, I ſhould find *fa*※ in this modulation, this *fa*※ diſcovers to me that I am not in the mode of *ut*, or at leaſt that, if I have been in it, I am no longer ſo.

232. In the ſame manner, if I form this ſcale in aſcending *la ſi ut*※ *re mi fa*※ *ſol*※ *la*, which is exactly ſimilar to the ſcale *ut re mi fa ſol la ſi ut* of the major mode of *ut*, this ſcale, in which the third form *la* to *ut*※ is major, ſhall be in the major mode of *la*; and if I incline to be in the minor mode of *la*, I have nothing to do but to ſubſtitute for *ut* ſharp *ut* natural; ſo that the major third *la ut*※ may become minor *la ut*; I ſhall have then

la ſi ut re mi fa※ *ſol*※ *la*,

which is (85) the ſcale of the minor mode of *la* in aſcending; and the ſcale of the minor mode of *la* in deſcending ſhall be (90)

la ſol fa mi ut re ſi la,

in which the *ſol* and *fa* are no longer ſharp. For it is a ſingularity peculiar to the minor mode, that its ſcale is not the ſame in riſing as in deſcending (89).

274 Hence it appears what ſharps and flats ſhould be placed at the cleff in the major mode of la, and why they are omitted in the minor mode in deſcending.

233. This is the reaſon why, when we wiſh to begin a piece in the major mode of *la*, we place three ſharps at the cleff upon *fa*, *ut*, and *ſol*; and on the contrary, in the minor mode of *la*, we place none, becauſe the minor mode of *la*, in deſcending, has neither ſharps nor flats.

234. As the ſcale contains twelve ſounds, each diſtant from the other by the interval of a ſemitone, it is obvious that each of theſe ſounds can produce both a major and a minor mode, which conſtitute 24 modes upon the whole. Of theſe we ſhall immediately give a table, which may be very uſeful to diſcover the mode in which we are.

275 Modes 24 in the whole.

A TABLE of the Different Modes.

Major Modes.

Maj. Mode.	
of *ut*	*ut re mi fa ſol la ſi ut.*
of *ſol*	*ſol la ſi ut re mi fa*※ *ſol.*
of *re*	*re mi fa*※ *ſol la ſi ut*※ *re.*
of *la*	*la ſi ut*※ *re mi fa*※ *ſol*※ *la.*
of *mi*	*mi fa*※ *ſol*※ *la ſi ut*※ *re*※ *mi.*
of *ſi*	*ſi ut*※ *re*※ *mi fa*※ *ſol*※ *la*※ *ſi.*
of *fa*※	*fa*※ *ſol*※ *ſi ut*※ *re*※ *mi*※ *fa*※ (AAAA).
of *ut*※ or *re*♭	*re*♭ *mi*♭ *fa ſol*♭ *la*♭ *ſi*♭ *ut re*♭.
of *ſol*※ or *la*♭	*la*♭ *ſi*♭ *ut re*♭ *mi*♭ *fa ſol la*♭.
of *re*※ or *mi*♭	*mi*♭ *fa ſol la*♭ *ſi*♭ *ut re mi*♭.

of

(AAAA) The major mode of *fa*※, of *ut*♭ or *re*※, and of *ſol*※ or *la*♭, are not much practiſed. In the opera of *Pyramus* and *Thiſbe*, p. 267, there is a paſſage in the ſcene, of which one part is the major mode of *fa*※, and the other in the major mode of *ut*※, and there are ſix ſharps at the cleff.

When a piece begins upon *ut*※, there ought to be ſeven ſharps placed at the cleff: but it is more convenient only to place five flats, and to ſuppoſe the key *re*♭, which is almoſt the ſame thing with *ut*※. It is for this reaſon that we ſubſtitute here the mode of *re*♭ for that of *ut*※.

It is ſtill much more neceſſary to ſubſtitute the mode of *la*♭ for that of *ſol*※; for the ſcale of the major mode of *ſol* is *ſol*, *la*※, *ſi*※, *ut*※, *re*※, *mi*※, *ſol*, *ſol*※, in which you may ſee that there are at the ſame time both a *ſol* natural and a *ſol*※: it would then be neceſſary, even at the ſame time, that upon *ſol* there ſhould and ſhould not be a ſharp at the cleff; which is ſhocking and inconſiſtent. It is true that this inconvenience may be avoided by placing a ſharp upon *ſol* at the cleff, and by marking the note *ſol* with a natural through the courſe of the muſic wherever it ought to be natural; but this would become troubleſome, above all if there ſhould be occaſion to tranſpoſe. In the article 236, we ſhall give an account of tranſpoſition. One might likewiſe in this ſeries, inſtead of *ſol* natural, which is the note immediately before the laſt, ſubſtitute *fa*※※, that is to ſay, *fa* twice ſharp: which, however, is not abſolutely the ſame ſound with *ſol* natural, eſpecially upon inſtruments whoſe ſcales are fixed, or whoſe intervals are invariable. But in that caſe two ſharps may be placed at the cleff upon *fa*, which would produce another inconvenience. But by ſubſtituting *la*♭ for *ſol*※, the trouble is eluded.

Principles of Compoſition.

of *la*※ or *ſi*♭ } *ſi*♭ *ut re mi*♭ *fa ſol la ſi.*
of *mi*※ or *fa*♭ } *fa ſol la ſi*♭ *ut re mi fa.*
of *ſi*※ or *ut*♭ } *ut re mi fa ſol la ſi ut.*

Minor Modes.

Of *la*.
In deſcending. *la ſol fa mi re ut ſi la.*
In riſing. *la ſi ut re mi fa*※ *ſol*※ *la.*

Of *mi*.
In deſcending. *mi re ut ſi la ſol fa*※ *mi.*
In riſing. *mi fa*※ *ſol la ſi ut*※ *re*※ *mi.*

Of *ſi*.
In deſcending. *ſi la ſol fa*※ *mi re ut*※ *ſi.*
In riſing. *ſi ut*※ *re mi fa*※ *ſol*※ *la*※ *ſi.*

Of *fa*※.
In deſcending. *fa*※ *mi re ut*※ *ſi la ſol*※ *fa.*
In riſing. *fa*※ *ſol*※ *la ſi ut*※ *re*※ *mi*※ *fa*※.

Of *ut*※.
In deſcending. *ut ſi la ſol*※ *fa*※ *mi re*※ *ut*※.
In riſing. *ut*※ *re*※ *mi fa*※ *ſol*※ *la*※ *ſi*※ *ut*※.

Of *ſol*※ or *la*♭.
In deſcending. *ſol*※ *fa*※ *mi ut*※ *ſi la*※ *ſol*※.
In riſing. *la*♭ *ſi*♭ *ut*♭ *re*♭ *mi*♭ *fa ſol la*♭.

Of *re*※ or *mi*♭.
In deſcending. *mi*♭ *re*♭ *ut*♭ *ſi*♭ *la*♭ *ſol*♭ *fa mi*♭.
In riſing. *mi*♭ *fa ſol*♭ *la*♭ *ſi*♭ *ut re mi*♭.

Of *la*※ or *ſi*♭.
In deſcending. *ſi*♭ *la* , *ſol*♭ *fa mi*♭ *re*♭ *ut ſi*♭.
In riſing. *ſi*♭ *ut re*♭ *mi*♭ *fa ſol la ſi*♭.

Of *mi*※ or *fa*♭.
In deſcending. *fa mi*♭ *re*♭ *ut ſi*♭ *la*♭ *ſol fa.*
In riſing. *fa ſol la*♭ *ſi*♭ *ut re mi fa.*

Of *ut*
In deſcending. *ut ſi*♭ *la*♭ *ſol fa mi*♭ *re ut.*
In riſing. *ut re mi*♭ *fa ſol la ſi ut.*

Of *ſol*.
In deſcending. *ſol fa mi*♭ *re ut ſi*♭ *la ſol.*
In riſing. *ſol la ſi*♭ *ut re mi fa*※ *ſol.*

Of *re*.
In deſcending. *re ut ſi*♭ *la ſol fa mi re.*
In riſing. *re mi fa ſol la ſi ut*※ *re* (BBBB.)

276 Modes crowded with ſharps and flats little practiſed.

235. Theſe then are all the modes, as well major as minor. Thoſe which are crowded with ſharps and flats are little practiſed, as being extremely difficult in execution.

277 Reſults.

236. From thence it follows,

1. That when there are neither ſharps nor flats at the cleff, it is a token that the piece begins in the major mode of *ut*, or in the minor mode of *la*.

2. That when there is one ſingle ſharp, it will always be placed upon *fa*, and that the piece begins in the major mode of *ſol*, or the minor of *mi*, in ſuch a manner that it may be ſung as if there were no ſharp, by ſinging *ſi* inſtead of *fa*※, and in ſinging the tune as if it had been in another cleff. For inſtance, let there be a ſharp upon *fa* in the cleff of *ſol* upon the firſt line; one may then ſing the tune as if there were no ſharp: And inſtead of the cleff of *ſol* upon the firſt line, let there be the cleff of *ut*; for the *fa*※, when changed into *ſi*, will require that the cleff of *ſol* ſhould be changed to the cleff of *ut*, as may be eaſily ſeen. This it what we call *tranſpoſition* (‡).

See Tranſpoſition.

278 All the modes reducible to the major of ut and the minor of la.

237. It is evident, that when *fa*※ is changed into *ſi*, *ſol* muſt be changed into *ut*, and *mi* into *la*. Thus by tranſpoſition, the air has the ſame melody as if it were in the major mode of *ut*, or in the minor mode of

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(BBBB) We have already ſeen, that in each mode, the principal note is called a *tonic;* that the fifth above that note is called a *tonic dominant*, or the *dominant of the mode*, or ſimply a *dominant;* that the fifth beneath the tonic, or, what is the ſame thing, the fourth above that tonic, is called a *ſub-dominant;* and in ſhort, that the note which forms a ſemitone beneath the tonic, and which is a third major from the dominant, is called a *ſenſible note*. The other notes have likewiſe in every mode particular names which it is advantageous to know. Thus a note which is a tone immediately above the tonic, as *re* in the mode of *ut*, and *ſi* in that of *la*, is termed a *ſub-tonic;* the following note, which is a third major or minor from the tonic, according as the chord is major or minor, ſuch as *mi* in the major mode of *ut*, and *ut* in the minor mode of *la*, is called a *mediant;* in ſhort, the note which is a tone above the dominant, ſuch as *la* in the mode of *ut*, and *fa*※ in that of *la*, is called a *ſub-dominant*.

‡ Though our author's account of this delicate operation in muſic will be found extremely juſt and compendious; though it proceeds upon ſimple principles, and comprehends every poſſible contingency; yet as the manner of thinking upon which it depends may be leſs familiar to Engliſh readers, if not profoundly ſkilled in muſic, it has been thought proper to give a more familiar, though leſs comprehenſive, explanation of the manner in which *tranſpoſition* may be executed.

It will eaſily occur to every reader, that if each of the intervals through the whole diatonic ſeries were equal, in a mathematical ſenſe, it would be abſolutely indifferent upon what note any air were begun, if within the compaſs of the gammut; becauſe the ſame equal intervals muſt always have the ſame effects. But ſince, beſides the natural ſemitones, there is another diſtinction of diatonic intervals into *greater* and *leſſer tones;* and ſince theſe vary their poſitions in the ſeries of an octave, according as the note from whence you begin is placed, that note is conſequently the beſt key for any tune whoſe natural ſeries is moſt exactly correſpondent with the intervals which that melody or harmony requires. But in inſtruments whoſe ſcales are fixed, notwithſtanding the temperament and other expedients of the ſame kind, ſuch a ſeries is far from being eaſily found, and is indeed in common practice almoſt totally neglected. All that can frequently be done is, to take care that the ear may not be ſenſibly ſhocked. This, however, would be the caſe, if, in tranſpoſing any tune, the ſituation of the ſemitones, whether natural or artificial, were not exactly correſpondent in the ſeries to which your air muſt be tranſpoſed, with their poſitions in the ſcale from which you tranſpoſe it. Suppoſe for of *la*. The major mode then of *ſol*, and the minor of *mi*, are by tranſpoſition reduced to thoſe of *ut* major, and of *la* minor. It is the ſame caſe with all the other modes, as any one may eaſily be convinced (cccc).

CHAP. XIII. *To find the Fundamental Baſs of a given Modulation.*

238. As we have reduced to a very ſmall number the rules of the fundamental baſs, and thoſe which in the treble ought to be obſerved with relation to this baſs, it ſhould no longer be difficult to find the fundamental baſs of a given modulation, nay, frequently to find ſeveral; for every fundamental baſs will be legitimate, when it is formed according to the rules which we have given (Chap. VI.); and that, beſides this, the diſſonances which the modulation may form with this

279 Method of finding a fundamental baſs to a given air not difficult, and why.

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for inſtance, your air ſhould begin upon *ut* or C, requiring the natural diatonic ſeries through the whole gammut, in which the diſtance between *mi* and *fa*, or E and F, as alſo that between *ſi* and *ut*, or B and C, is only a ſemitone. Again, ſuppoſe it neceſſary for your voice, or the inſtrument on which you play, that the ſame air ſhould be tranſpoſed to *ſol* or G, a fifth above its former key; then becauſe in the firſt ſeries the intervals between the third and the fourth, ſeventh and eighth notes, are no more than ſemitones, the ſame intervals muſt take the ſame place in the octave to which you tranſpoſe. Now, from *ſol* or G, the note with which you propoſe to begin, the three tones immediately ſucceeding are full; but the fourth, *ut* or C, is only a ſemitone; it may therefore be kept in its place. But from *fa* or F, the ſeventh note above, to *ſol* or G, the eighth, the interval is a full tone, which muſt conſequently be redreſſed by raiſing your *fa* a ſemitone higher. Thus the ſituations of the ſemitonic intervals in both octaves will be correſpondent; and thus, by conforming the poſitions of the ſemitones in the octave to which you tranſpoſe, with thoſe in the octave in which the original key of the tune is contained, you will perform your operation with as much ſucceſs as the nature of fixed ſcales can admit: But the order in which you muſt proceed, and the intervals required in every mode are minutely and ingeniouſly delineated by our author.

(cccc) Two ſharps, *fa*※ and *ut*※, indicate the major mode of *re*, or the minor of *ſi*; and then, by tranſpoſition, the *ut*※ is changed into *ſi*, and of conſequence, *re* into *ut* and *ſi* into *la*.

Three ſharps, *fa*※ *ut*※ *ſol*※ indicate the major mode of *la*, or the minor of *fa*※; and it is then *ſol*※, which muſt be changed into *ſi*, and of conſequence *la* into *ut*, and *fa*※ into *la*.

Four ſharps, *fa*※ *ut*※ *ſol*※ *re*※, indicate the major mode of *mi*, or the minor of *ut*※; then the *re*※ is changed into *ſi*, and of conſequence *mi* into *ut*, and *ut*※ into *la*.

Five ſharps, *fa*※ *ut*※ *ſol*※ *re*※ *la*※, indicate the major mode of *ſi*, or the minor of *ſol*※; *la* then is changed into *ſi*, and of conſequence *ſi* into *ut*, and *ſol*※ into *la*.

Six ſharps, *fa*※ *ut*※ *ſol*※ *re*※ *la*※ *mi*※, indicate the major mode of *fa*※; *mi*※ then is changed into *ſi*, and of conſequence *fa*※ into *ut*.

Six flats, *ſi*♭ *mi*♭ *la*♭ *re* *ſol*♭ *ut*♭, indicate the minor mode of *mi*♭; *ut* is changed into *fa*, and of conſequence *mi*♭ into *la*.

Five flats, *ſi*♭ *mi*♭ *la*♭ *re*♭ *ſol*♭, indicate the major mode of *re*♭, or the minor mode of *ſi*♭; then the *ſi*♭ is changed into *fa*, and of conſequence the *re*♭ into *ut*, and the *ſi*♭ into *la*.

Four flats, *ſi*♭ *mi*♭ *la*♭ *re*♭, indicate the major mode of *la*♭, or the minor mode of *fa*; *re*♭ then is changed into *fa*, and of conſequence *la*♭ into *ut*, and *fa* into *la*.

Three flats, *ſi* *mi* *la*♭, indicate the major mode of *mi*♭, or the minor of *ut*; the *la*♭ then is changed into *fa*, and of conſequence *mi*♭ into *ut*, and the *ſol* into *la*.

Two flats, *ſi*♭ *mi*♭, indicate the major mode of *ſi*♭, or the minor of *ſol*; *mi*♭ then is changed into *fa*, and of conſequence *ſi*♭ into *ut*, and the *fa* into *la*.

One flat, *ſi*♭, indicates the major mode of *fa*, or the minor mode of *re*, and *ſi*♭ is changed into *fa*; of conſequence the *fa* is changed into *ut*, and the *re* into *la*.

All the major modes then may be reduced to that of *ut*, and the modes minor to that of *la* minor.

It only remains to remark, that many muſicians, and amongſt others the ancient muſicians of France, as Lulli, Campra, &c. place one flat leſs in the minor mode: ſo that in the minor mode of *re*, they place neither ſharp nor flat at the cleff; in the minor mode of *ſol*, one flat only; in the minor mode of *ut*, two flats, &c.

This practice in itſelf is ſufficiently indifferent, and ſcarcely merits the trouble of a diſpute. Yet the method which we have here deſcribed, according to M. Rameau, has the advantage of reducing all the modes to two; and beſides it is founded upon this ſimple and very general rule, That in the major mode, we muſt place as many ſharps or flats at the cleff, as are contained in the diatonic ſcale of that mode in aſcending; and in the minor mode, as many as are contained in that ſame ſcale in deſcending.

However this be, I here preſent you with a rule for tranſpoſition, which appears to me more ſimple than the rule in common uſe.

For the Sharps.

Suppoſe *ſol*, *re*, *la*, *mi*, *ſi*, *fa*, and change *ſol* into *ut* if there is one ſharp at the cleff, *re* into *ut* if there are two ſharps, *la* into *ut* if there are three, &c.

For the Flats.

Suppoſe *fa*, *ſi*, *mi*, *la*, *re*, *ſol*, and change *fa* into *ut* if there is only one flat at the cleff, *ſi* into *ut* if there are two flats, *mi* into *ut* if there are three, &c.

this baſs, will both be prepared, if it is neceſſary that they ſhould be ſo, and always reſolved (DDDD).

280 Difficulty of aſſigning general rules for aſcertaining the mode of a melody whoſe fundamental baſs is ſought.

239. It is of the greateſt utility in ſearching for the fundamental baſs, to know what is the tone or mode of the melody to which that baſs ſhould correſpond. —But it is difficult in this matter to aſſign general rules, and ſuch as are abſolutely without exception, in which nothing may be left that appears indifferent or diſcretionary; becauſe ſometimes we ſeem to have the free choice of referring a particular melody either to one mode or another. For example, this melody *ſol ut* may belong to all the modes, as well major as minor, in which *ſol* and *ut* are found together; and each of theſe two ſounds may even be conſidered as belonging to a different mode.

281 Reaſons why one may proceed without the knowledge of the mode, and how he may be preſerved from deviating in compoſition.

240. For what remains, one may ſometimes, as it ſhould ſeem, operate without the knowledge of the mode, for two reaſons: 1. Becauſe, ſince the ſame ſounds belong to ſeveral different modes, the mode is ſometimes conſiderably undetermined; above all, in the middle of a piece, and during the time of one or two bars. 2. Without giving ourſelves much trouble about the mode, it is often ſufficient to preſerve us from deviating in compoſition, if we obſerve in the ſimpleſt manner the rules above preſcribed (ch. VI.) for the procedure of the fundamental baſs.

282 Knowledge of the mode in beginning a piece indiſpenſable, and why.

241. In the mean time, it is above all things neceſſary to know in what mode we operate at the beginning of the piece, becauſe it is indiſpenſable that the fundamental baſs ſhould begin in the ſame mode, and that the treble and baſs ſhould likewiſe end in it; nay, that they ſhould even terminate in its fundamental note, which in the mode of *ut* is *ut*, and *la* in that of *la*, &c. Beſides, in thoſe paſſages of the modulation where there is a cadence, it is generally neceſſary that the mode of the fundamental baſs ſhould be the ſame with that of the part to which it correſponds.

283 Inveſtigation of the mode continued.

242. To know upon what mode or in what key a piece commences, our inquiry may be entirely reduced to diſtinguiſh the major mode of *ut* from the minor of *la*. For we have already ſeen (art. 236. and 237), that all the modes may be reduced to theſe two, at leaſt in the beginning of the piece. We ſhall now therefere give a detail of the different means by which theſe two modes may be diſtinguiſhed.

284 Means by which the modes may be determined.

1. From the principal and characteriſtical ſounds of the mode, which are *ut mi ſol* in the one, and *la ut mi* in the other; ſo that if a piece ſhould, for inſtance, begin thus, *la ut mi la*, it may be almoſt conſtantly concluded, that the tone or mode is in *la* minor, although the notes *la ut mi* belong to the mode of *ut*.

2. From the ſenſible note, which is *ſi* in the one, and *ſol* ♯ in the other; ſo that if *ſol* ♯ appears in the firſt bars of a piece, one may be certain that he is in the mode of *la*.

3. From the adjuncts of the mode, that is to ſay, the modes of its two fifths, which for *ut* are *fa* and *ſol*, and *re* and *mi* for *la*. For example, if after having begun

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(DDDD) We often ſay, *that we are upon a particular key*, inſtead of ſaying *that we are in a particular mode*. The following expreſſions therefore are ſynonymous; *ſuch a piece is in* ut *major*, or *in the mode of* ut *major*, or *in the key of* ut *major*.

We have ſeen that the diatonic ſcale or gammut of the Greeks was *la ſi ut re mi fa ſol la* (art. 49.) A method has likewiſe been invented of repreſenting each of the ſounds in this ſcale by a letter of the alphabet; *la* by A, *ſi* by B, *ut* by C, &c. It is from hence that theſe forms of ſpeaking proceed: Such a piece is upon A *with* mi, la, *and its third minor*; or, ſimply, it is upon A, *with* mi, la, *and its minor*; ſuch another piece upon C, *with* ſol, ut, *and its third major*; or, ſimply, upon C, *with* ſol, ut, *and its major*; to ſignify that the one is the mode of *la minor*, or that the other is in that of *ut major*; this laſt manner of ſpeaking is more conciſe, and on this account it begins to become general.

They likewiſe call the cleff of *ut fa* F, the cleff of *re ſol* G, &c. to denominate the cleff of *fa*, the cleff of *ſol*. &c,

They ſay likewiſe to take the A *mi la*, to give the A *mi la*; that is to ſay, to take the uniſon of a certain note called *la* in the harpſichord, which *la* is the ſame that occupies the fifth line, or the higheſt line in the firſt cleff of *fa*. This *la* divides in the middle the two octaves which ſubſiſt (note RR) between the *ſol* which occupies the firſt line in the cleff of *ſol* upon that ſame line, and that *ſol* which occupies the firſt line in the cleff of *fa* upon the fourth; and as it poſſeſſes (if we may ſpeak ſo) the middle ſtation between the ſharpeſt and loweſt ſounds, it has been choſen to be the ſound with relation to which all the voices and inſtruments ought to be tuned in a concert (§).

(§) Thus far our author: and though the note is no more than an illuſtration of the technical phraſeology in his native language, we did not think it conſiſtent with the fidelity of a tranſlation to omit it. We have little reaſon to envy, and ſtill leſs to follow, the French in their abbreviations of ſpeech; the native energy of our tongue ſuperſedes this neceſſity in a manner ſo effectual, that, in proportion as we endeavour to become ſuccinct, our ſtyle, without the ſmalleſt ſacrifice of perſpicuity, becomes more agreeable to the genius of our language; whereas, in French, laconic diction is equally ambiguous and diſagreeable. Of this we cannot give a more flagrant inſtance than the note upon which theſe obſervations are made, in its original. We muſt, however, follow the author's example, in reciting a few technical phraſes upon the ſame ſubject, which occur in our language, and which, if we are not miſtaken, will be found equally conciſe, at the ſame time that they are more natural and intelligible. When we mean to expreſs the fundamental note of that ſeries within the diatonic octave which any piece of muſic demands, we call that note the *key*. When we intend to ſignify its mode, whether major or minor, we denominate the harmony *ſharp* or *flat*. When in a concert we mean to try how inſtruments are in tune by that note upon which, according to the genius of each particular inſtrument, they may beſt agree in uniſon, we deſire the muſicians who join us to ſound A.

Principles of Compoſition.

gun a melody by ſome of the notes which are common to the modes of *ut* and of *la* (as *mi re mi fa mi re ut ſi ut*), I ſhould afterwards find the mode of *ſol*, which I aſcertain by the *fa*※, or that of *fa* which I aſcertain by the *ſi*♭ or *ut*♮, I may conclude that I have begun in the mode of *ut;* but if I find the mode of *re*, or that of *mi*, which I aſcertain by *ſi*♭, *ut*※, or *re*※, &c. I conclude from thence that I have begun in the mode of *la*.

4. A mode is not for ordinary deſerted, eſpecially in the beginning of a piece, but that we may paſs into one or other of theſe modes which are moſt relative to it, which are the mode of its fifth above, and that of its third below, if the original mode be major, or of its third above if it be minor. Thus, for inſtance, the modes which are moſt intimately relative to the major mode of *ut*, are the major mode of *ſol*, and that of *la* minor. From the mode of *ut* we commonly paſs either into the one or the other of theſe modes; ſo that we may ſometimes judge of the principal mode in which we are, by the relative mode which follows it, or which goes before it, when theſe relative modes are deciſively marked. For what remains, beſides theſe two relative modes, there are likewiſe two others into which the principal mode may paſs, but leſs frequently, viz. the mode of its fifth below, and that of its third above, as *fa* and *mi* for the mode of *ut* (EEEE).

5. The modes may ſtill be likewiſe diſtinguiſhed by the cadences of the melody. Theſe cadences ought to occur at the end of every two, or at moſt of every four bars, as in the fundamental baſs: now the note of the fundamental baſs which is moſt ſuitable to theſe cloſes*, is always eaſy to be found. For the ſounds which occur in the treble may be conſulted M. Rameau, p. 54. of his *Nouveau Syſteme de Muſique theorique et pratique* (FFFF).

* See Cadence.

285 Having aſcertained the mode, the fundamental baſs not difficult.

When a perſon is once able to aſcertain the mode, and can render himſelf ſure of it by the different means which we have pointed out, the fundamental baſs will coſt little pains. For in each mode there are three fundamental ſounds.

1. The tonic of the mode, or its principal ſound, which carries always the perfect chord major or minor, according as the mode itſelf is major or minor.

Major mode of UT. *ut mi ſol ut.*
Minor mode of LA. *la ut mi la.*

2. The tonic dominant, which is a fifth above the tonic, and which, whether in the major or minor mode, always carries a chord of the ſeventh, compoſed of a third major followed by two thirds minor.

Tonic dominant.
Major mode of UT. *ſol ſi re fa.*
Tonic dominant.
Minor mode of LA. *mi ſol*※ *ſi re.*

3. The ſub-dominant, which is a fifth below the tonic, and which carries a chord compoſed of a third, fifth, and ſixth major, the third being either greater or leſſer, according as the mode is major or minor.

Sub-dominant.
Major mode of UT. *fa la ut re.*
Minor mode of LA. *re fa la ſi.*

Theſe three ſounds, the tonic, the tonic dominant, and the ſub-dominant, contain in their chords all the notes which enter into the ſcale of the mode; ſo that when a melody is given, it may almoſt always be found which of theſe three ſounds ſhould be placed in the fundamental baſs, under any particular note of the upper part. Yet it ſometimes happens that not one of theſe notes can be uſed. For example, let it be ſuppoſed that we are in the mode of *ut*, and that we find in the melody theſe two notes *la ſi* in ſucceſſion; if we confine ourſelves to place in the fundamental baſs one of the three ſounds *ut ſol fa*, we ſhall find nothing for the ſounds *la* and *ſi* but this fundamental baſs $\overset{6}{fa}$ $\overset{7}{ſol}$; now ſuch a ſucceſſion as $\overset{6}{fa}$ to $\overset{7}{ſol}$ is prohibited by the fifth rule for the fundamental baſs, according to which every ſub-dominant, as *fa*, ſhould riſe by a fifth; ſo that $\overset{6}{fa}$ can only be followed by *ut* in the fundamental baſs, and not by $\overset{7}{ſol}$.

To remedy this, the chord of the ſub-dominant *fa la ut re* muſt be inverted into a fundamental chord of the ſeventh, in this manner, *re fa la ut*, which has been called the *double employment* (art. 105.) becauſe it is a ſecondary manner of employing the chord of the ſub-

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(EEEE) It is certain that the minor mode of *mi* has an extremely natural connection with the mode of *ut*, as has been proven (art. 92.) both by arguments and by examples. It has likewiſe appeared in the note upon the art. 93. that the minor mode of *re* may be joined to the major mode of *ut:* and thus in a particular ſenſe, this mode may be conſidered as relative to the mode of *ut*, but it is ſtill leſs ſo than the major modes of *ſol* and *fa*, or than thoſe of *la* and *mi* minor; becauſe we cannot immediately, and without licence, paſs in a fundamental baſs from the perfect minor chord of *ut* to the perfect minor chord of *re;* and if you paſs immediately from the major mode of *ut* to the minor mode of *re* in a fundamental baſs, it is by paſſing, for inſtance, from the tonic *ut*, or from *mi ſol ut*, to the tonic dominant of *re*, carrying the chord *la ut*※ *mi ſol*, in which there are two ſounds, *mi ſol*, which are found in the preceding chord; or otherwiſe from *ut mi ſol ut* to *ſol ſi*♭ *re mi*, a chord of the ſub-dominant in the minor mode of *re*, which chord has likewiſe two ſounds, *ſol* and *mi*, in common with that which went immediately before it.

(FFFF) All theſe different manners of diſtinguiſhing the modes ought, if we may ſpeak ſo, to give mutual light and aſſiſtance one to the other. But it often happens, that one of theſe ſigns alone is not ſufficient to determine the mode, and may even lead to error. For example, if a piece of muſic begins with theſe three notes, *mi ut ſol*, we muſt not with too much precipitation conclude from thence that we are in the major mode of *ut*, although theſe three ſounds, *mi ut ſol*, be the principal and characteriſtical ſounds in the major mode of *ut*. We may be in the minor mode of *mi*, eſpecially if the note *mi* ſhould be long. You may ſee an example in the fourth act of *Zoroaſter*, where the firſt air ſung by the prieſts of Arimanes begins thus with two times *ſol mi*♭ *ſi*♭, each of theſe notes being a crotchet. The air is in the minor mode of *ſol*, and not in the major mode of *mi*♭, as one would at firſt be tempted to believe it. Now we may be ſenſible that it is in *ſol* minor, by the relative modes which follow, and by the notes where the cadences fall.

ſub-dominant. By theſe means we give to the modulation *la ſi*, this fundamental baſs *re ſol*, which procedure is agreeable to rules.

Here then are four chords, *ut mi ſol ut*, *ſol ſi re fa*, *fa la ut re*, *re fa la ut*, which may be employed in the major mode of *ut*. We ſhall find in like manner, for the minor mode of *la*, four chords,

la ut mi la, *mi ſol ♯ ſi re*,
re fa la ſi, *ſi re fa la*.

And in this mode we ſometimes change the laſt of theſe chords into *ſi re fa ♯ la*, ſubſtituting the *fa ♯* for *fa ♮*. For inſtance, if we have this melody in the minor mode of *la mi fa ♯ ſol ♯ la*, we would cauſe the firſt note *mi* to carry the perfect chord *la ut mi la*, the ſecond note *fa ♯* to carry the chord of the ſeventh *ſi re fa ♯ la*; the third note *ſol ♯* the chord of the tonic dominant *mi ſol ♯ ſi re*, and in fine, the laſt the perfect chord *la ut mi la*.

On the contrary, if this melody is given always in the minor mode *la la ſol ♯ la*, the ſecond *la* being ſyncopated, it might have the ſame baſs as the modulation *mi fa ♯ ſol ♯ la*, with this difference alone, that *fa ♮* might be ſubſtituted for *fa ♯* in the chord *ſi re fa ♯ la*, the better to mark out the minor mode.

Beſides theſe chords which we have juſt mentioned, and which may be regarded as the principal chords of the mode, there are ſtill a great many others; for example, the ſeries of dominants,

7 7 7 7 7 7 7 7 7 7
ut la re ſol ut fa ſi mi la re ſol ut

which are terminated equally in the tonic *ut*, either entirely belong, or at leaſt may be reckoned as belonging (GGGG) to the mode of *ut*; becauſe none of theſe dominants are tonic dominants, except *ſol*, which is the tonic dominant of the mode of *ut*; and beſides, becauſe the chord of each of theſe dominants forms no other ſounds than ſuch as belong to the ſcale of *ut*.

But if I were to form this fundamental baſs,

7 7 7 7 ♭
ut la re ſol ut,

conſidering the laſt *ut* as a tonic dominant in this manner *ut mi ſol ſi ♭*; the mode would then be changed at the ſecond *ut*, and we ſhould enter into the mode of *fa*, becauſe the chord *ut mi ſol ſi ♭* indicates the tonic dominant of the mode of *fa*; beſides, it is evident that the mode is changed, becauſe *ſi ♭* does not belong to the ſcale of *ut*.

In the ſame manner, were I to form this fundamental baſs

7 7 7 6
ut la re ſol ut,

conſidering the laſt *ut* as a tonic dominant in this manner, *ut mi ſol la*; this laſt *ut* would indicate the mode of *ſol*, of which *ut* is the *ſub-dominant*.

In like manner, ſtill, if in the firſt ſeries of dominants, I cauſed the firſt *re* to carry the third major, in this manner *re fa ♯ la ut*; this *re* having become a tonic dominant, would ſignify to me the major mode of *ſol*, and the $\overset{7}{ſol}$ which ſhould follow it, carrying the chord $\overset{7}{ſi}$ *re fa*, would relapſe into the mode of *ut*, from whence we had departed.

Finally, in the ſame manner, if in this ſeries of dominants, one ſhould cauſe *ſi* to carry *fa ♯* in this manner, *ſi re fa ♯ la*, this *fa* would ſhow that we had departed from the mode *ut*, to enter into that of *ſol*.

From hence it is eaſy to form this rule for diſcovering the changes of mode in the fundamental baſs.

256
A rule for diſcovering the change of mode.

1. When we find a tonic in the fundamental baſs, we are in the mode of that tonic; and the mode is major or minor, according as the perfect chord is major or minor.

2. When we find a ſub-dominant, we are in the mode of the fifth above that ſub-dominant; and the mode is major or minor, according as the third in the chord of the ſub dominant is major or minor.

3. When we find a tonic dominant, we are in the mode of the fifth below that tonic dominant. As the tonic dominant carries always the third major, one cannot be ſecure by the aſſiſtance of this dominant alone, whether the mode be major or minor: but it is only neceſſary for the compoſer to caſt his eye upon the following note, which muſt be the tonic of the mode in which he is; by the third of this tonic he will diſcover whether the mode be major or minor.

243. Every change of the mode ſuppoſes a cadence; and when the mode changes in the fundamental baſs, it is almoſt always either after the tonic of the mode in which we have been, or after the tonic dominant of that mode, conſidered then as a tonic by favour of a cloſe which ought neceſſarily to be found in that place: Whence it happens that cadences in a melody for the moſt part preſage a change of mode which ought to follow them.

244. All theſe rules, joined with the table of modes which we have given (art. 234.), will ſerve to diſcover in what mode we are in the middle of a piece, eſpecially in the moſt eſſential paſſages, as cadences (HHHH).

I here ſubjoin the ſoliloquy of Armida, with the continued and fundamental baſſes. The changes of the mode will be eaſily diſtinguiſhed in the fundamental baſs,

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(GGGG) I have ſaid, *that they may be reckoned as belonging to this mode*, for two reaſons: 1 Becauſe, properly ſpeaking, there are only three chords which eſſentially and primitively belong to the mode of *ut*, viz. *ut* carrying the perfect chord, *fa* carrying that of the ſub-dominant, and *ſol* that of the tonic dominant, to which we may join the chord of the ſeventh, *re fa la ut* (art. 105.): but we here regard *as extended* the ſeries of dominants in queſtion, as belonging to the mode of *ut*, becauſe it preſerves in the ear the impreſſion of that mode. 2. In a ſeries of dominants, there are a great many of them which likewiſe belong to other modes; for inſtance, the ſimple dominant *la* belongs naturally to the mode of *ſol*, the ſimple dominant *ſi* to that of *la*, &c. Thus it is only improperly, and by way of extenſion, as I have already ſaid, that we regard here theſe dominants as belonging to the mode of *ut*.

(HHHH) Two modes are ſo much more intimately relative as they contain a greater number of ſounds common to both; for example, the minor mode of *ut* and the major of *ſol*, or the major mode of *ut* and the minor of

Principles of Compoſition.

baſs, by the rules which we have juſt given at the end of the article 242. This ſoliloquy will ſerve for a leſſon to beginners. M. Rameau quotes it in his New Syſtem of Muſic, as an example of modulation highly juſt and extremely ſimple. (See Plate VI. and the following (IIII).

CHAP. XIV. *Of the Chromatic and Enharmonic.*

287 Chromatic, what.

245. WE call that melody *chromatic* which is compoſed of ſeveral notes in ſucceſſion, whether riſing or deſcending by ſemitones. (See LXXXVIII. and LXXXIX.)

288 To an air deſcending by chromatic intervals, fundamental baſs, what.

246. When an air is chromatic in deſcending, the moſt natural and ordinary fundamental baſs is a concatenated ſeries of tonic dominants; all of which follow one another in deſcending by a fifth, or which is the ſame thing, in riſing by a fourth. See LXXXVIII (LLLL).

289 Aſcending, what.

247. When the air is chromatic in aſcending, one may form a fundamental baſs by a ſeries of tonics and of tonic dominants, which ſucceed one another alternately by the interval of a third in deſcending, and of a fourth in aſcending, (ſee LXXXIX. There are many other ways of forming a chromatic air, whether in riſing or deſcending; but theſe details in an elementary eſſay are by no means neceſſary.

290 Enharmonic little practiſed.

248. With reſpect to the enharmonic, it is very rarely put in practice; and we have explained its formation in the firſt book, to which we refer our readers. We ſhall content ourſelves with ſaying, that, in the beautiful ſoliloquy of the fourth act of Dardanus, at the words *lieux funeſtes*, &c. "fatal places, &c." we find an example of the enharmonic; an example of the diatonic enharmonic in the trio of the Fatal Siſters, in Hippolitus and Aricia, at the words, *Ou cours-tu malheureux*, "Whither, unhappy, doſt thou run;" and that there are no examples of the chromatic enharmonic, at leaſt in our French operas. M. Rameau had imitated an earthquake by this ſpecies of muſic, in the ſecond act of the Gallant Indians; but he informs us, that in 1735 he could not cauſe it to be executed by the band. The trio of the Fatal Siſters in Hippolitus has never been ſung in the opera as it is compoſed. But M. Rameau aſſerts, (and we have heard it elſewhere by people of taſte, before whom the piece was performed), and the trial had ſucceeded when made by able hands that were not mercenary, and that its effect was aſtoniſhing.

CHAP. XV. *Of Deſign, Imitation, and Fugue.*

See Deſign.

291 Deſign, what.

249. IN muſic, the name of *deſign*, or *ſubject*, is generally given to a particular air or melody, which the compoſer intends ſhould prevail through the piece; whether it is intended to expreſs the meaning of words to which it may be ſet, or merely inſpired by the impulſe of taſte and fancy. In this laſt caſe, deſign is diſtinguiſhed into *imitation* and *fugue*.

See Imitation.

292 Imitation, what.

250. *Imitation* conſiſts in cauſing to be repeated the melody of one or of ſeveral bars in one ſingle part, or in the whole harmony, and in any of the various modes that

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of *la*: on the contrary, two modes are leſs intimately relative as the number of ſounds which they contain as common to both is ſmaller; for inſtance, the major mode of *ut* and the minor of *ſi*, &c.

When you find yourſelf led away by the current of the modulation, that is to ſay, by the manner in which the fundamental baſs is conſtituted, into a mode remote from that in which the piece was begun, you muſt continue in it but for a ſhort time, becauſe the ear is always impatient to return to the former mode.

(IIII) It is extremely proper to remark, that we have given the fundamental, the continued baſs, and in general the modulation of this ſoliloquy, merely as a leſſon in compoſition extremely ſuitable to *beginners*; not that we recommend the ſoliloquy in itſelf as a model of expreſſion. Upon this laſt object what we have ſaid may be ſeen in what we have written concerning the liberties to be taken in muſic, Vol. IV. p. 435, of our Literary Miſcellany. It is preciſely becauſe this ſoliloquy is a proper leſſon for initiates, that it would be a bad one for the mature and ingenious artiſt. The novice ſhould learn tenaciouſly to obſerve his rules; the man of art and genius ought to know on what occaſions and in what manner they may be violated when this expedient becomes neceſſary.

(LLLL) We may likewiſe give to a chromatic melody in deſcending, a fundamental baſs, into which may enter chords of the ſeventh and of the diminiſhed ſeventh, which may ſucceed one another by the intervals of a falſe fifth and a fifth redundant: thus in the Example XC. where the continued baſs deſcends chromatically, it may eaſily be ſeen that the fundamental baſs carries ſucceſſively the chords of the ſeventh and of the ſeventh diminiſhed, and that in this baſs there is a falſe fifth from *re* to *ſol*※, and a fifth redundant from *ſol*※ to *ut*.

The reaſon of this licence is, as it appears to me, becauſe the chord of the diminiſhed ſeventh may be conſidered as repreſenting (art. 221.) the chord of the tonic dominant; in ſuch a manner that this fundamental baſs

$$\textit{la}\ \overset{7}{\textit{re}}\ \overset{\dot{7}}{\textit{ſol}\text{※}}\ \overset{7}{\textit{ut}}\ \overset{7}{\textit{fa}\text{※}}\ \overset{7}{\textit{ſi}}\ \overset{\overset{7}{\text{※}}}{\textit{mi}}\ \textit{la}$$

(ſee Example XCI.) may be conſidered as repreſenting (art. 116.) that which is written below,

$$\textit{la}\ \overset{7}{\textit{re}}\ \overset{\overset{7}{\text{※}}}{\textit{mi}}\ \overset{7}{\textit{ut}}\ \overset{7}{\textit{fa}\text{※}}\ \overset{7}{\textit{ſi}}\ \overset{\overset{7}{\text{※}}}{\textit{mi}}\ \textit{la}$$

Now this laſt fundamental baſs is formed according to the common rules, unleſs that there is a broken cadence from *re* to $\overset{\overset{7}{\text{※}}}{\textit{mi}}$, and an interrupted cadence from *mi* to *ut*, which are licenſes (art. 213 and 214.)

that may be choſen. When all the parts abſolutely repeat the ſame air * or melody, and beginning one after the other, this is called a *canon*. *Fugue* conſiſts in alternately repeating that air in the treble, and in the baſs, or even in all the parts, if there are more than two.

* See Air, Canon, Fugue.

293
Principal rules for compoſing in ſeveral parts.

251. Imitation and fugue are ſometimes conducted by rules merely deducible from taſte, which may be ſeen in the 332d and following pages of M. Rameau's *Treatiſe on Harmony;* where will likewiſe be found a detail of the rules for compoſition in ſeveral parts. The chief rules for compoſition in ſeveral parts are, that the diſcords ſhould be found, as much as poſſible, prepared and reſolved in the ſame part; that a diſcord ſhould not be heard at the ſame time in ſeveral parts, becauſe its harſhneſs would diſguſt the ear; and that in no particular part there ſhould be found two octaves or two fifths in ſucceſſion (MMMM) with reſpect to the baſs. Muſicians, however, do not heſitate ſometimes to violate this precept, when taſte or occaſion require. In muſic, as in all the other fine arts, it is the buſineſs of the artiſt to aſſign and to obſerve rules; the province of men who are adorned with taſte and genius is to find the exceptions.

CHAP. XVI. *Definitions of the Different Airs.*

252. WE ſhall finiſh this treatiſe by giving in a few words the characteriſtic diſtinctions of the different airs to which names have been given, as *chacoon, minuet, rigadoon*, &c.

The *chacoon* is a long piece of muſic, containing three times in each bar, of which the movement is regular, and the bars ſenſibly diſtinguiſhed. It conſiſts of ſeveral couplets, which are varied as much as poſſible. Formerly the baſs of the chacoon was a *conſtrained baſs*, or regulated by a rythmus terminating in 4 bars, and proceeding again by the ſame number; at preſent compoſers of this ſpecies no longer confine themſelves to that practice. The chacoon begins, for the moſt part, not with the perfect time, which is ſtruck by the hand or foot, but with the imperfect, which paſſes while the hand or foot is elevated

The *vilanelle* is a chacoon a little more lively, with its movement ſomewhat more briſk than the ordinary chacoon.

The *paſſacaille* only differs from a chacoon as it is more ſlow, more tender, and beginning for ordinary with a perfect time.

The *minuet* is an air in triple time, whoſe movement is regular, and neither extremely briſk nor ſlow, conſiſting of two parts or ſtrains, which are each of them repeated; and for which reaſon they are called by the French *repriſes:* each ſtrain of the minuet begins with a time which is ſtruck, and ought to conſiſt of 4, of 8, or of 12 bars; ſo that the cadences may be eaſily diſtinguiſhed, and recur at the end of each 4 bars.

The *ſarabando* is properly a ſlow minuet; and the *courant* a very ſlow ſarabando: this laſt is no longer in uſe. The *paſſepied* is properly a very briſk minuet, which does not begin like the common minuet, with a ſtroke of the foot or hand; but in which each ſtrain begins in the laſt of the three times of which the bar conſiſts.

The *loure* is an air whoſe movement is ſlow, whoſe time is marked with $\frac{6}{4}$, and where two of the times in which the bar conſiſts are beaten; it generally begins with that in which the foot is raiſed. For ordinary the note in the middle of each time is ſhortened, and the firſt note of the ſame time pointed.

The *jig* is properly nothing elſe but a loure very briſk, and whoſe movement is extremely quick.

The *forlana* is a moderate movement, and in a mediocrity between the loure and the jig.

The *rigadoon* has two times in a bar, is compoſed of two ſtrains, each to be repeated, and each conſiſting of 4, of 8, or of 12 bars: its movement is lively; each ſtrain begins, not with a ſtroke of the foot, but at the laſt note of the ſecond time.

The *bourée* is almoſt the ſame thing with the rigadoon.

The *gavotte* has two times in each bar, is compoſed of two ſtrains, each to be repeated, and each conſiſting of 4, of 8, or of 12 bars: the movement is ſometimes ſlow, ſometimes briſk; but never extremely quick, nor very ſlow.

The *tambourin* has two ſtrains, each to be repeated, and each conſiſting of 4, of 8, or of 12 bars, &c. Two of the times that make up each bar are beaten, and are very lively; and each ſtrain generally begins in the ſecond time.

The *muſette* conſiſts of two or three times in each bar; its movement is neither very quick nor very ſlow; and for its baſs it has often no more than a ſingle note, which may be continued through the whole piece.

A P P E N D I X.

THE treatiſe of D'Alembert, of which we have given a tranſlation, is well entitled to the merit of accuracy; but perhaps a perſon who has not particularly ſtudied the ſubject, may find difficulty in following the ſcientific deductions of that author.—We ſubjoin, therefore, a few general obſervations on the philoſophy of muſical ſound, commonly called *harmonics*, which may perhaps convey the full portion of knowledge of the theory of muſic, with which one in ſearch only of general information, and not a profeſſed ſtudent of this particular ſcience, would chooſe to reſt ſatisfied.

The theory of muſical ſound, which only in the beginning of the preſent century was ultimately eſtabliſhed by mathematical demonſtration, is no other than that which diſtinguiſhed the ancient muſical ſect

who

(MMMM) Yet there may be two fifths in ſucceſſion, provided the parts move in contrary directions, or, in other words, if the progreſs of one part be aſcending, and the other deſcending; but in this caſe they are not properly two fifths, they are a fifth and a twelfth; for example, if one of the parts in deſcending ſhould ſound *fa re*, and the other *ut la* in riſing, *ut* is the fifth of *fa*, and *la* the twelfth of *re*.

General obſervations on Harmonics

who followed the opinions of Pythagoras on that ſubject.

No part of natural philoſophy has been more fruitful of hypotheſes than that of which muſical ſound is the object. The muſical ſpeculators of Greece arranged themſelves into a great number of different ſects, the chief of whom were the Pythagoreans and the Ariſtoxenians.

Pythagoras ſuppoſed the air to be the *vehicle* of ſound, and the agitation of that element, occaſioned by a ſimilar agitation in the parts of the ſounding body, to be the *cauſe* of it. The vibrations of a ſtring or other ſonorous body, being communicated to the air, affected the auditory nerves with the ſenſation of ſound; and this ſound, he argued, was acute or grave in proportion as the vibrations were quick or ſlow.—He diſcovered by experiment, that of two ſtrings equal in every thing but length, the ſhorter made the quicker vibrations, and emitted the acuter ſound:—in other words, that the number of vibrations made in the ſame time, by two ſtrings of different lengths, was inverſely as theſe lengths; that is, the greater the length the ſmaller the number of vibrations in any given time. Thus ſound, conſidered in the vibrations that cauſe it, and the dimenſions of the vibrating body, came to be reduced to quantity, and as ſuch was the ſubject of calculation, and expreſſible by numbers.—For inſtance, the two ſounds that form an octave could be expreſſed by the numbers 1 and, 2, which would repreſent either the number of vibrations in a given time, or the length of the ſtrings; and would mean, that the acuter ſound vibrates twice, while the graver vibrates once; or that the ſtring producing the lower ſound is twice the length of that which gives the higher. If the vibrations were conſidered, the higher ſound was as 2, the lower as 1; the reverſe, if the length was alluded to. In the ſame manner, in the ſame ſenſe, the 5th would be expreſſed by the ratio of 2 to 3, and the 4th by that of 3 to 4.

Ariſtoxenus, in oppoſition to the calculations of Pythagoras, held the ear to be the ſole ſtandard of muſical proportions. That ſenſe he accounted ſufficiently accurate for muſical, though not for mathematical, purpoſes; and it was in his opinion abſurd to aim at an artificial accuracy in gratifying the ear beyond its own power of diſtinction. He, therefore, rejected the velocities, vibrations, and proportions of Pythagoras as foreign to the ſubject, in ſo far as they ſubſtituted *abſtract cauſes* in the room of *experience*, and made muſic the object of *intellect* rather than of *ſenſe*.

Of late, however, as has been already mentioned, the opinions of Pythagoras have been confirmed by abſolute demonſtration; and the following propoſitions, in relation to muſical ſound, have paſſed from conjecture to certainty.

Sound is generated by the vibrations of elaſtic bodies, which communicate the like vibrations to the air, and theſe again the like to our organs of hearing. This is evident, becauſe ſounding bodies communicate tremors to other bodies at a diſtance from them. The vibrating motion, for inſtance, of a muſical ſtring, excites motion in others, whoſe tenſion and quantity of matter diſpoſe their vibrations to keep time with the undulations of air propagated from it (the ſtring firſt ſet in motion.)

If the vibrations be iſochronous, and the ſound muſical, continuing at the ſame pitch, it is ſaid to be acuter, ſharper, or higher, than any other ſound whoſe vibrations are ſlower; and graver, flatter, or lower, than any other whoſe vibrations are quicker.—For while a muſical ſtring vibrates, its vibrations become quicker by increaſing its tenſion or diminiſhing its length; its ſound at the ſame time will be more acute: and, on the contrary, by diminiſhing its tenſion or increaſing its length, the vibrations will become ſlower and the ſound graver. The like alteration of the pitch of the ſound will follow, by applying, by means of a weight, an equal degree of tenſion to a thicker or heavier and to a ſmaller or lighter ſtring, both of the ſame length, as in the ſmaller ſtring the maſs of matter to be moved by the ſame force is leſs.

If ſeveral ſtrings, however, different in length, denſity, and tenſion, vibrate altogether in equal times, their ſounds will have all one and the ſame pitch, however they may differ in loudneſs or other qualities.—They are called *uniſons*. The vibrations of uniſons are iſochronous.

The vibrations of a muſical ſtring, whether wider or narrower, are nearly iſochronous. Otherwiſe, while the vibrations decreaſe in breadth till they ceaſe, the pitch of the ſound could not continue the ſame (which we perceive by experience it does), unleſs where the firſt vibrations are made very violently; in which caſe, the ſound is a little acuter at the beginning than afterwards.

Laſtly, the word *vibration* is underſtood to mean the time which paſſes between the departure of the vibrating body from any aſſigned place and its return to the ſame.

Glaſs-Muſic. See HARMONICA.

MUSIMON, in natural hiſtory, the name of an animal eſteemed a ſpecies of ſheep, deſcribed by the ancients as common in Corſica, Sardinia, Barbary, and the north-eaſt parts of Aſia. It has been doubted whether the animal deſcribed under this name is now any where to be found in the world; and whether it was not, probably, a ſpurious breed between two animals of different ſpecies, perhaps the ſheep and goat, which, like the mule, not being able to propagate its ſpecies, the production of them may have been diſcontinued.

Buffon ſuppoſes it to be the ſheep in a wild ſtate; and it is deſcribed as ſuch by Mr Pennant. Theſe animals live in the mountains, and run with great ſwiftneſs among the rocks. Thoſe of Kamtſchatka are ſo ſtrong, that 10 men can ſcarce hold one; and the horns are ſo large as ſometimes to weigh 30 pounds, and

Tone tone semitone tone tone tone semitone.

A *ut re mi fa sol la si UT*

B *ut re mi fa sol la si UT RE MI FA SOL &c*

Scale first. *Scale Second.*

The diatonic Scale of the Greeks.

D *Si Ut Re Mi Fa Sol La*

Sol Ut Sol Ut Fa Ut Fa

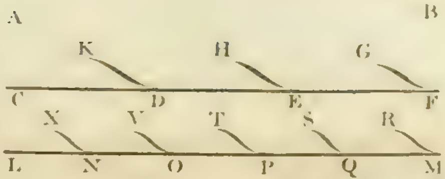
The Fundamental baſs.

E *Ut Re Mi Fa Sol Sol La Si Ut*

Ut Sol Ut Fa Ut Sol Re Sol Ut

The Fundamental baſs.

C



The Chromatic Species.

Scale.

K *Sol Sol &c.*

Ut Mi Sol

The Fundamental baſs.

Scale.

L *Ut Mi Si ♯*

Ut Mi Sol ♯

The Fundamental baſs.

F *UT, UT ♯, re, re ♯, mi, mi ♯, fa ♯, SOL, sol ♯, LA, la ♯, si, si ♯, ut, ut ♯, RE, RE ♯, MI, MI ♯.*

Scale first. *Scale Second.*

The first Scale of the minor mode.

G *Sol La Si Ut Re Mi Fa*

Third minor. *Third minor.* *Third minor.*

Mi La Mi La Re La Re

The Fundamental baſs.

Scale.

N *Mi♯ Mi Mi Mi Mi♯*

Ut Ut La Ut Ut

The Fundamental baſs.

The second Scale of the minor mode.

H *La Si Ut Re Mi mi fa ♯ Sol ♯ La*

La Mi La Re La Mi Si Mi La

The Fundamental baſs.

Scale.

I *Ut Re Mi Fa Sol La Si Ut*

Ut Sol Ut Fa Ut Re Sol Ut

Scale.

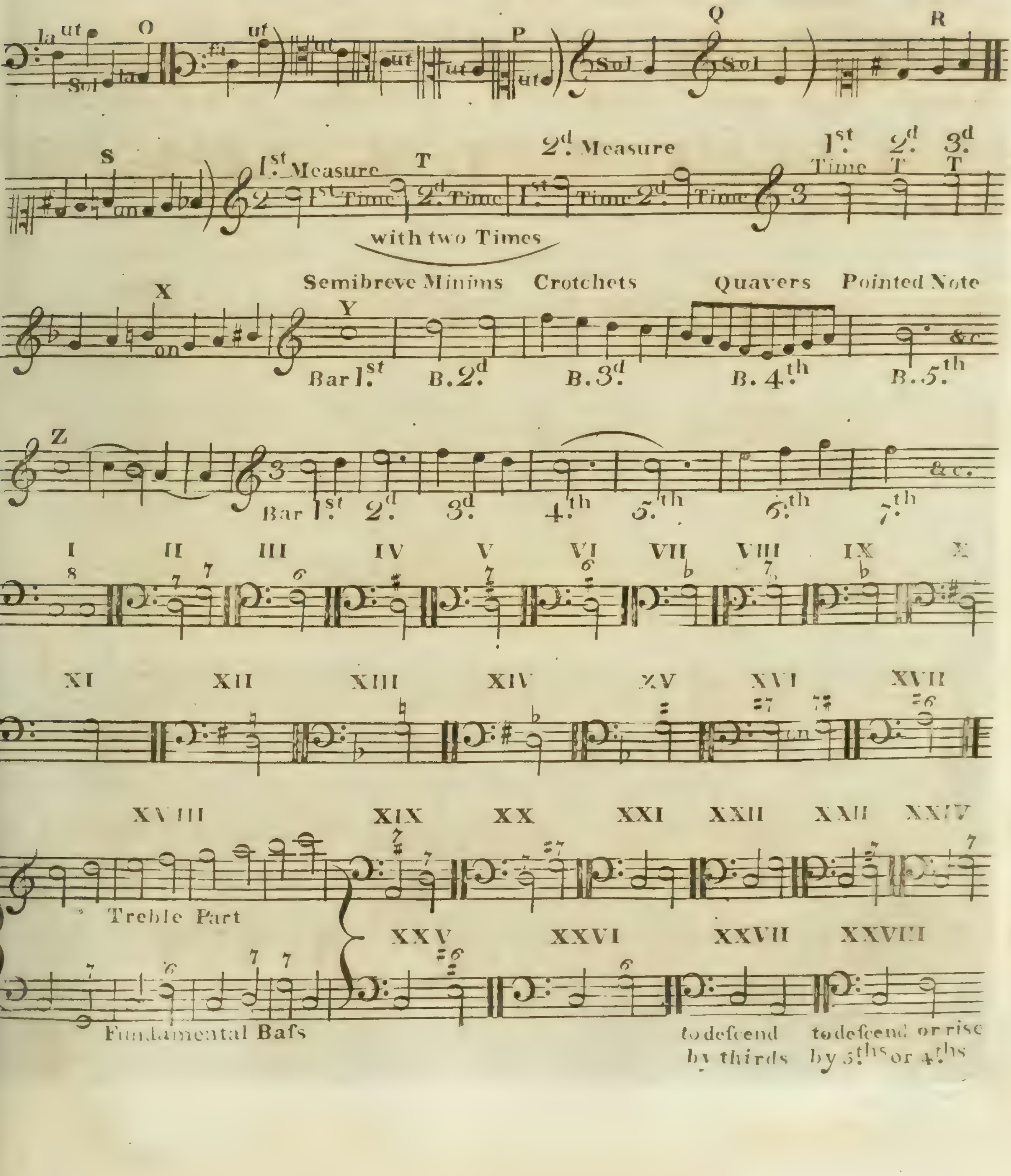
M *Fa Mi Mi Re*

Fa Ut Mi Si

The Fundamental baſs.

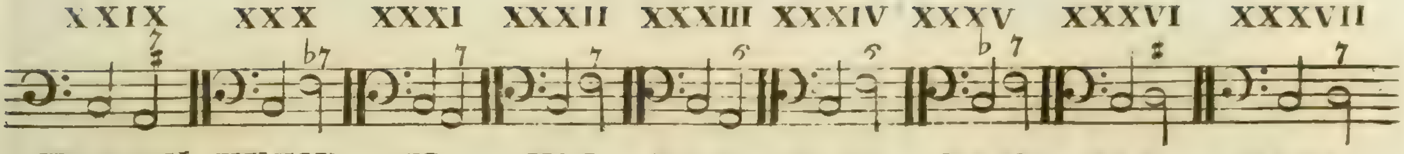
[illegible]

MUSIC



la ut
Sol la
O
fa ut
ut ut
P
ut ut
Q
Sol Sol
R
S
on
1st Measure
T
1st Time 2d Time
2d Measure
1st Time 2d Time
1st Time
2d T
3d T
with two Times
X
on
Y
Semibreve Minims
Crotchets
Quavers
Pointed Note
Bar 1st
B. 2d
B. 3d
B. 4th
B. 5th
&c
Z
3
Bar 1st 2d 3d 4th 5th 6th 7th
&c.
I II III IV V VI VII VIII IX X
8 7 7 6 7 6 7
XI XII XIII XIV XV XVI XVII
on
XVIII
Treble Part
Fundamental Baſs
XIX XX XXI XXII XXIII XXIV
XXV XXVI XXVII XXVIII
to deſcend by thirds
to deſcend or riſe by 5ths or 4ths

MUSIC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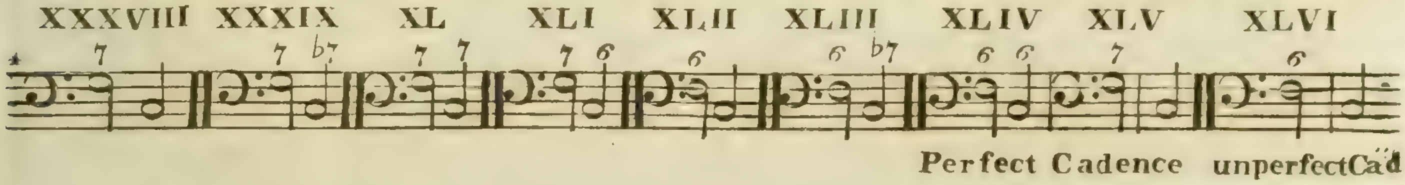
XXXVII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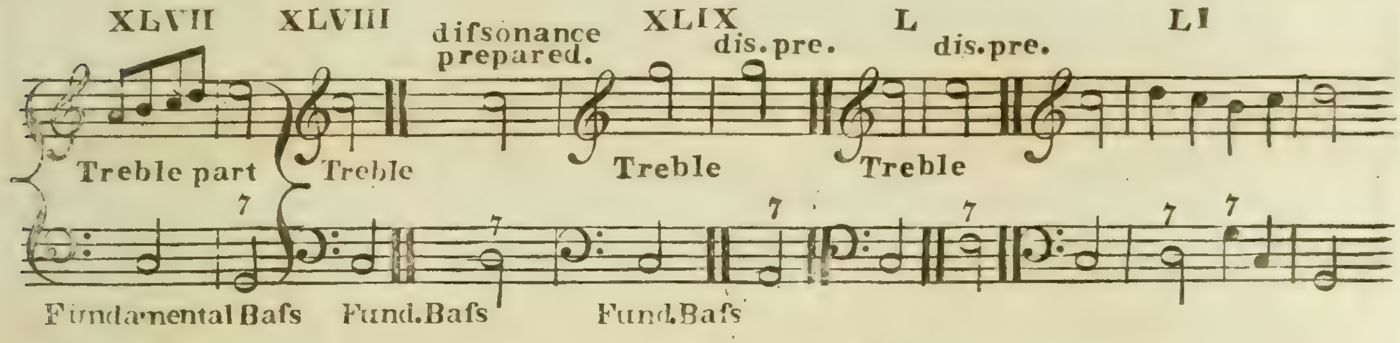
XLVI
Perfect Cadence
unperfect Cad.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difsonance prepared.
XLIX
dis. pre.
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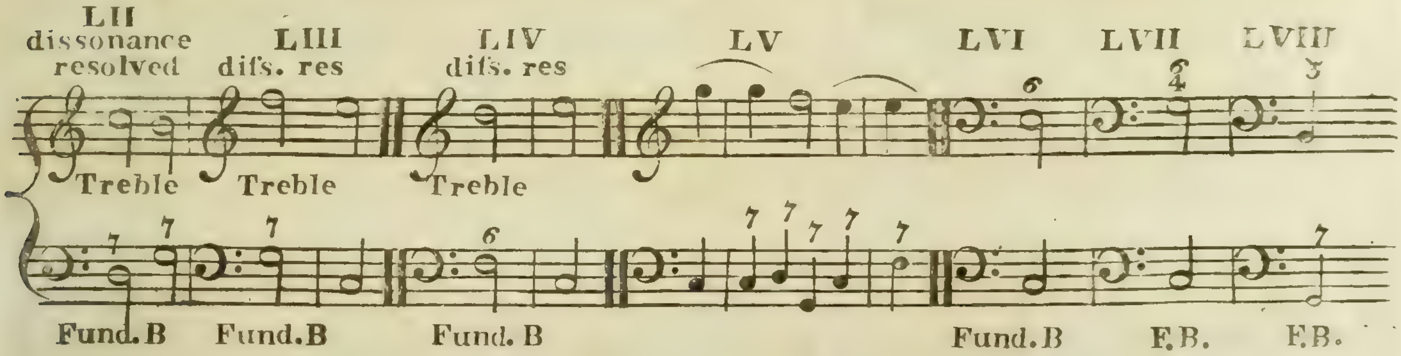
Treble
Treble
Treble
Fundamental Bafs
Fund. Bafs
Fund. Bafs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LIII
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LIV
difs. res
LV
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Treble
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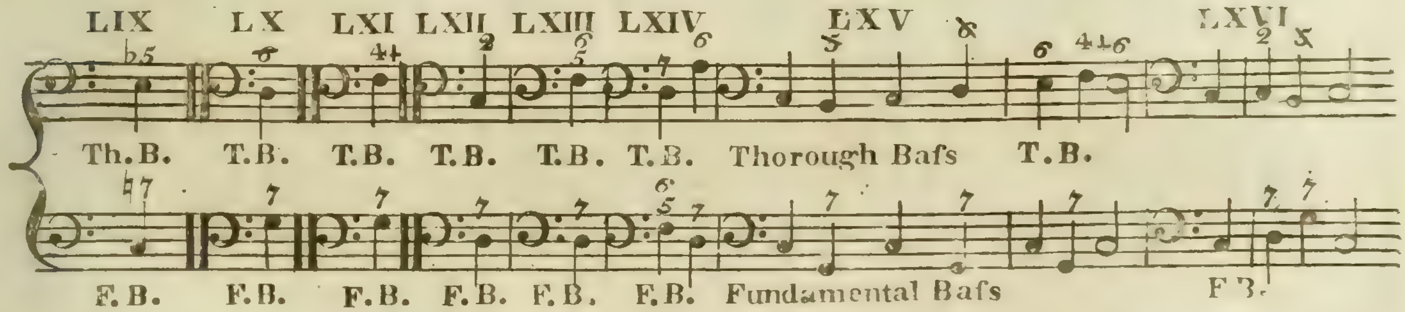
Fund. B
Fund. B
F.B.
F.B.


LIX
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Th. B.
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T.B.
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T.B.
T.B.
Thorough Bafs
T.B.
F.B.
F.B.
F.B.
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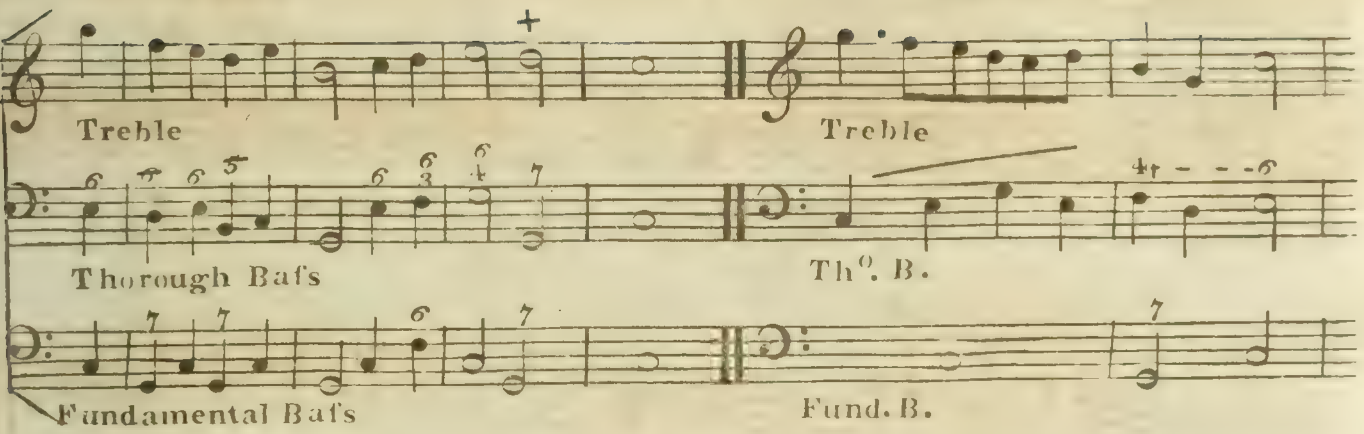
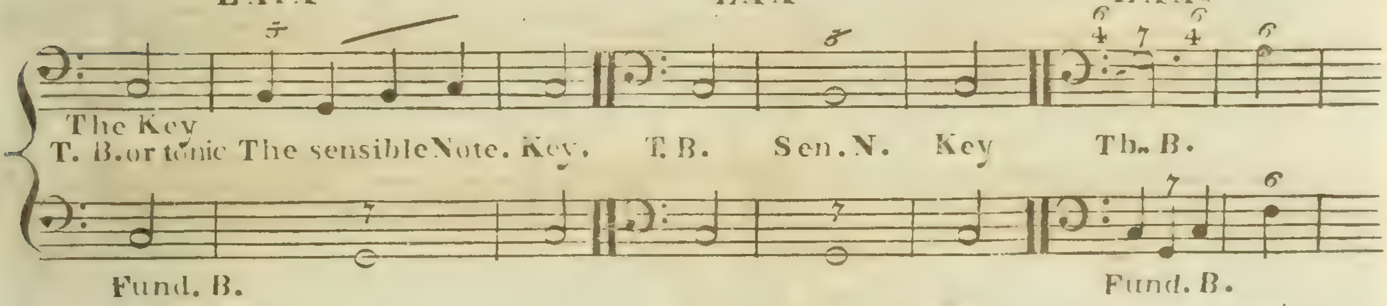
Fundamental Bafs
F.B.

MUSIC

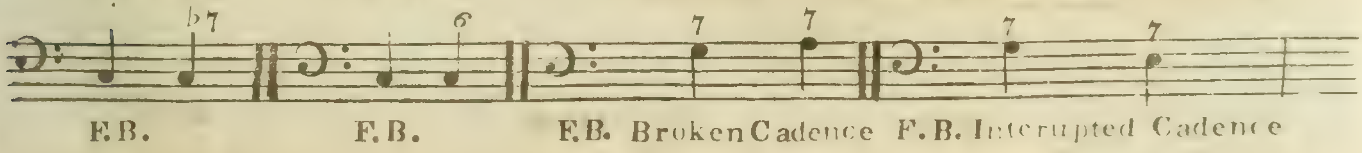
LXVII LXVIII



LXIX LXX LXXI



LXXII LXXIII LXXIV LXXV



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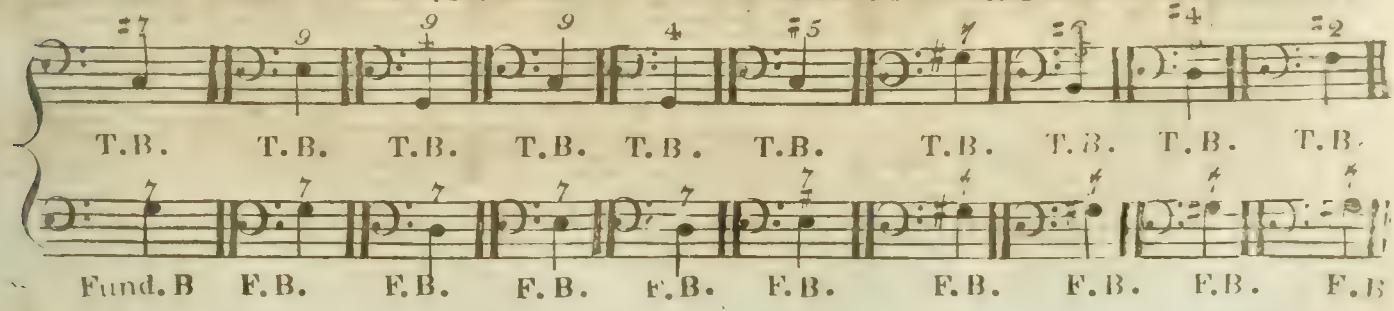
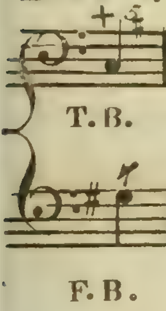


LXXXVI.



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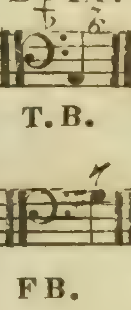
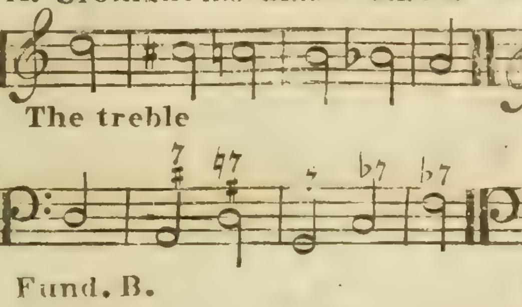


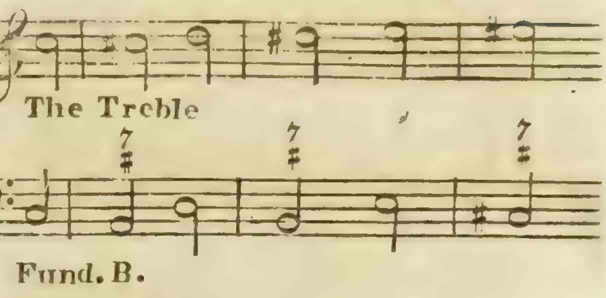
LXXXVIII.

Cromatic modulation deſcen^{gr}.

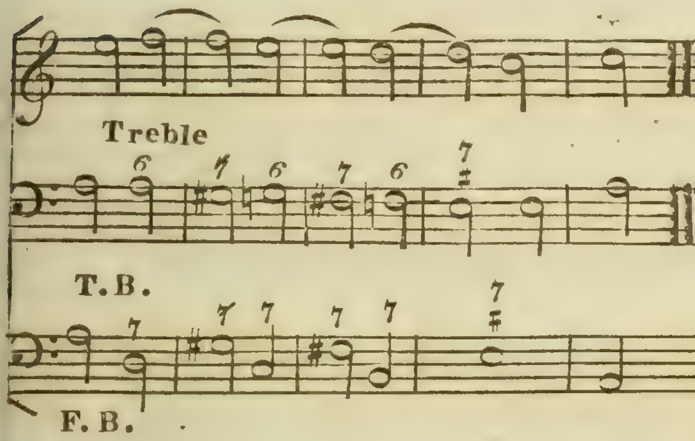


LXXXIX.

Cromatic modulation aſcending.



XC



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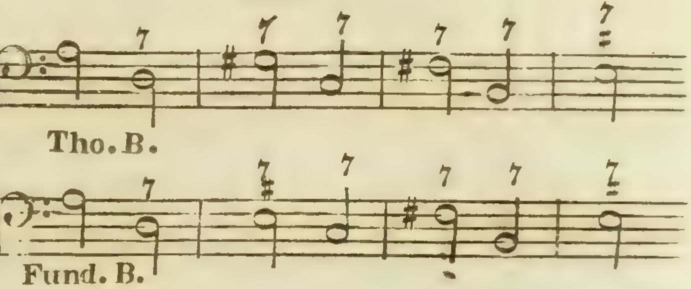

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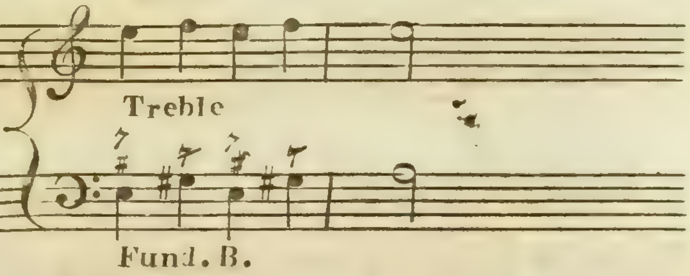

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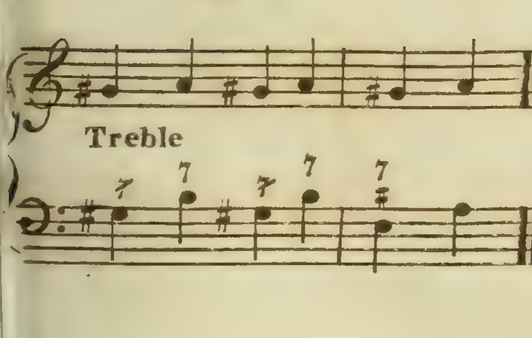

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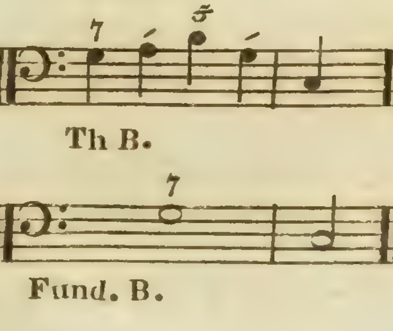
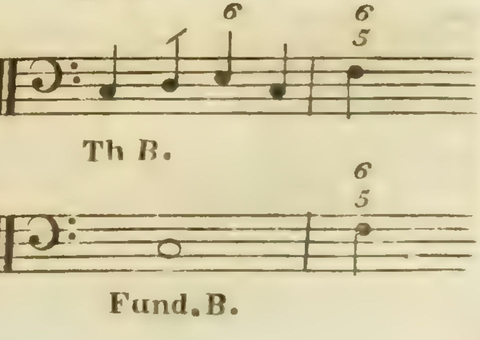
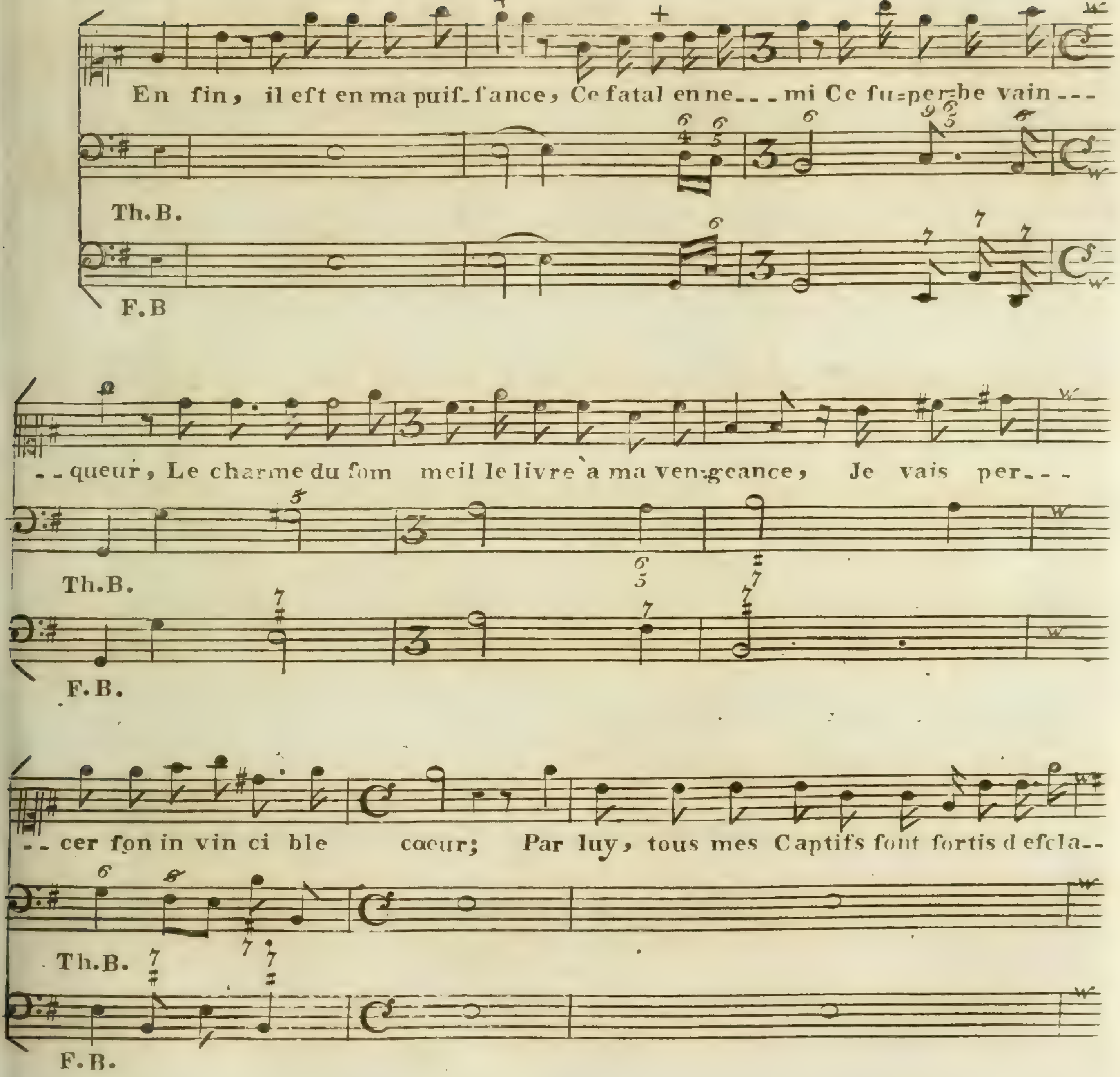
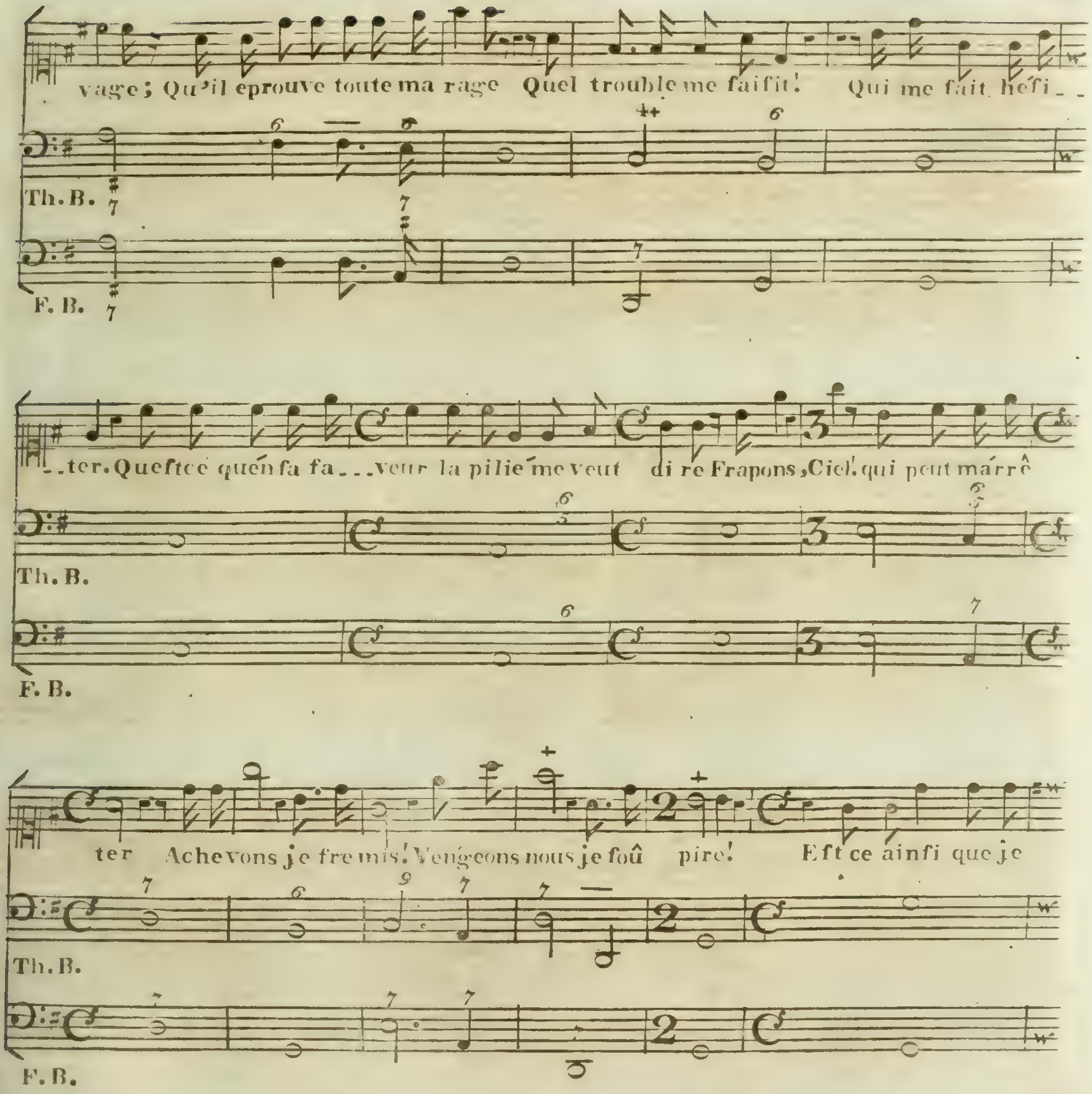
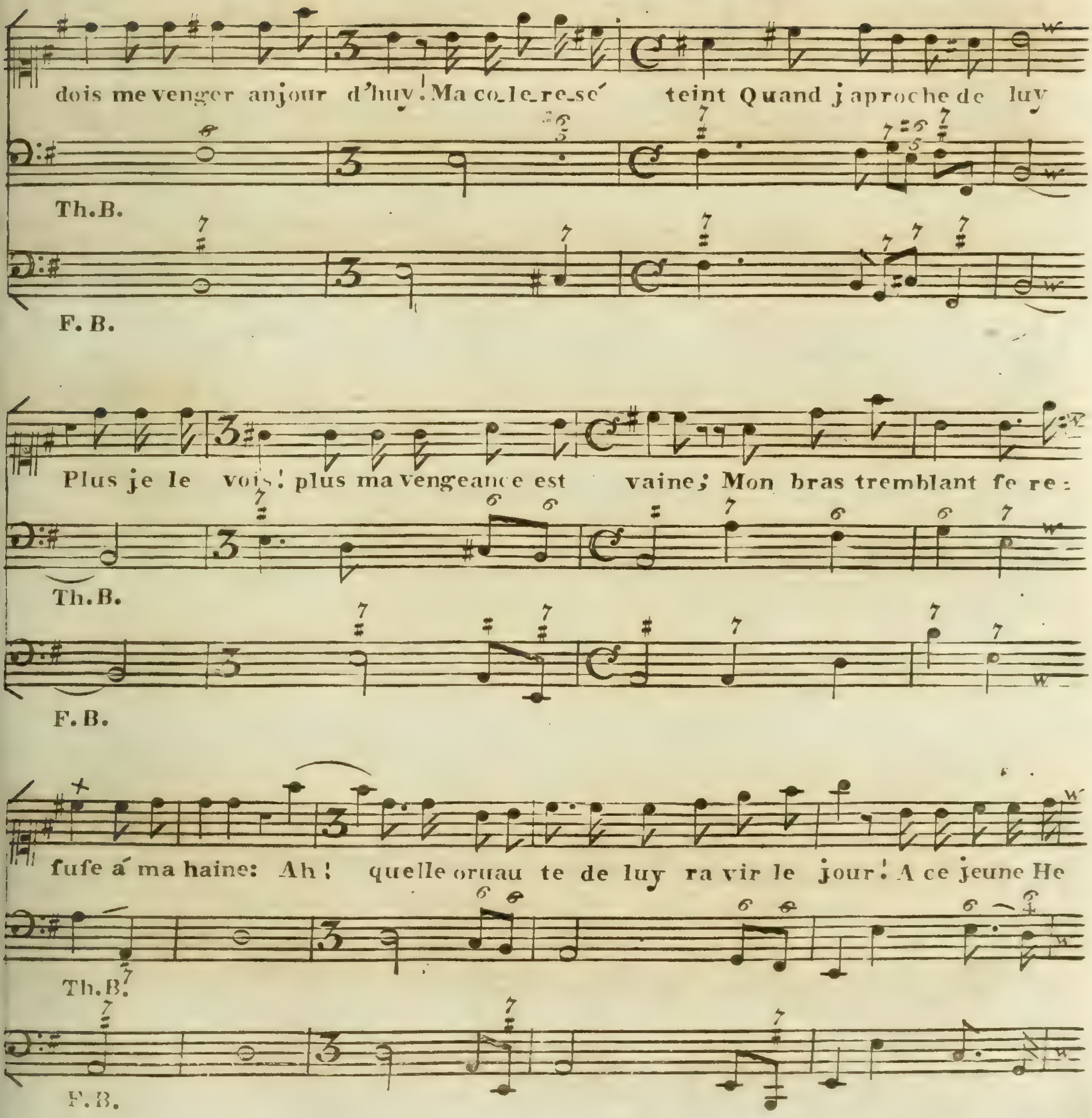


XCV

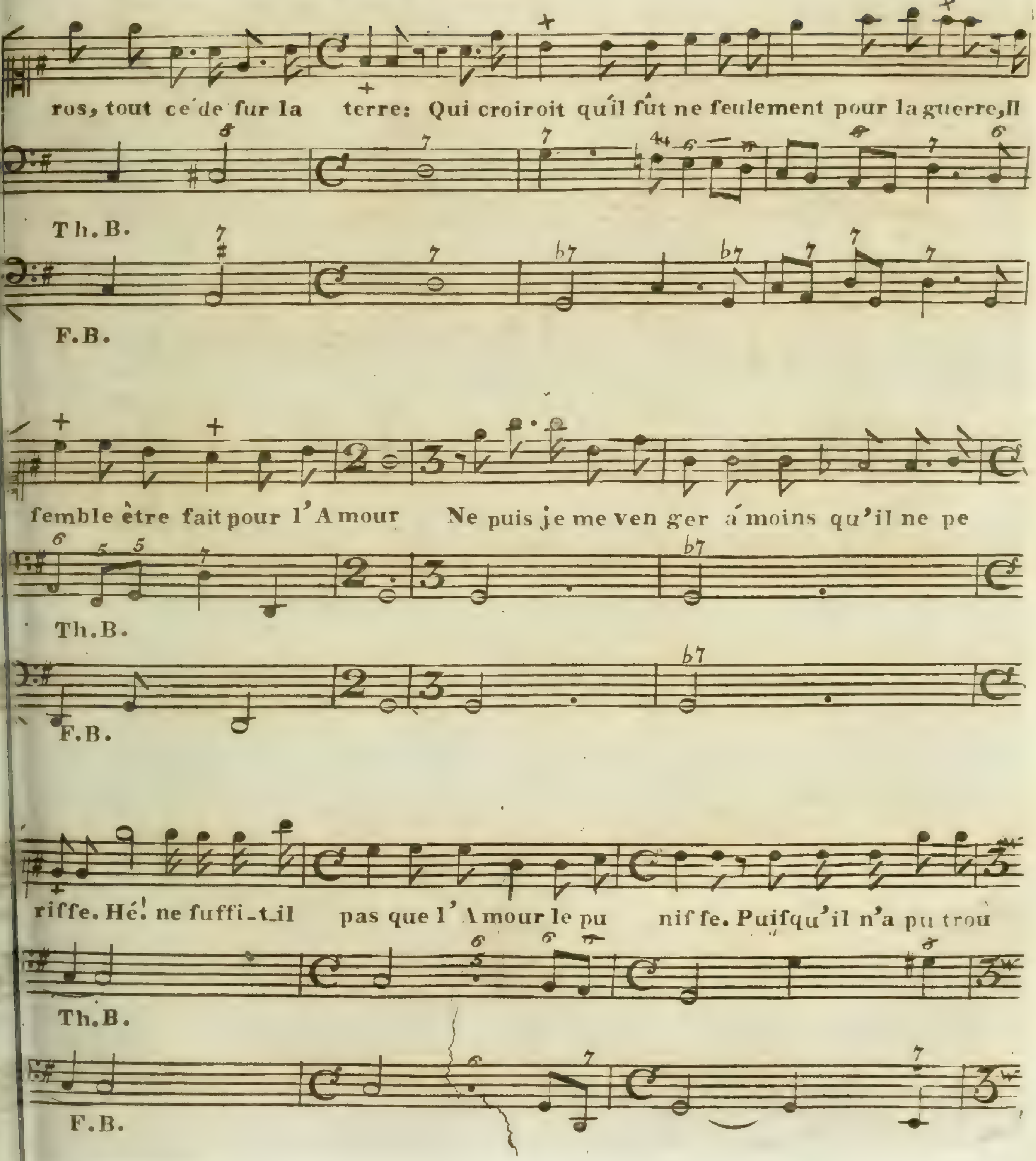



En fin, il eſt en ma puiſ-ſance, Ce fatal enne---mi Ce ſu-per-be vain---
Th.B.
F.B
--queur, Le charme du ſom meil le livre à ma ven-geance, Je vais per---
Th.B.
F.B.
--cer ſon in vin ci ble cœur; Par luy, tous mes Captifs ſont ſortis d eſcla--
Th.B.
F.B.

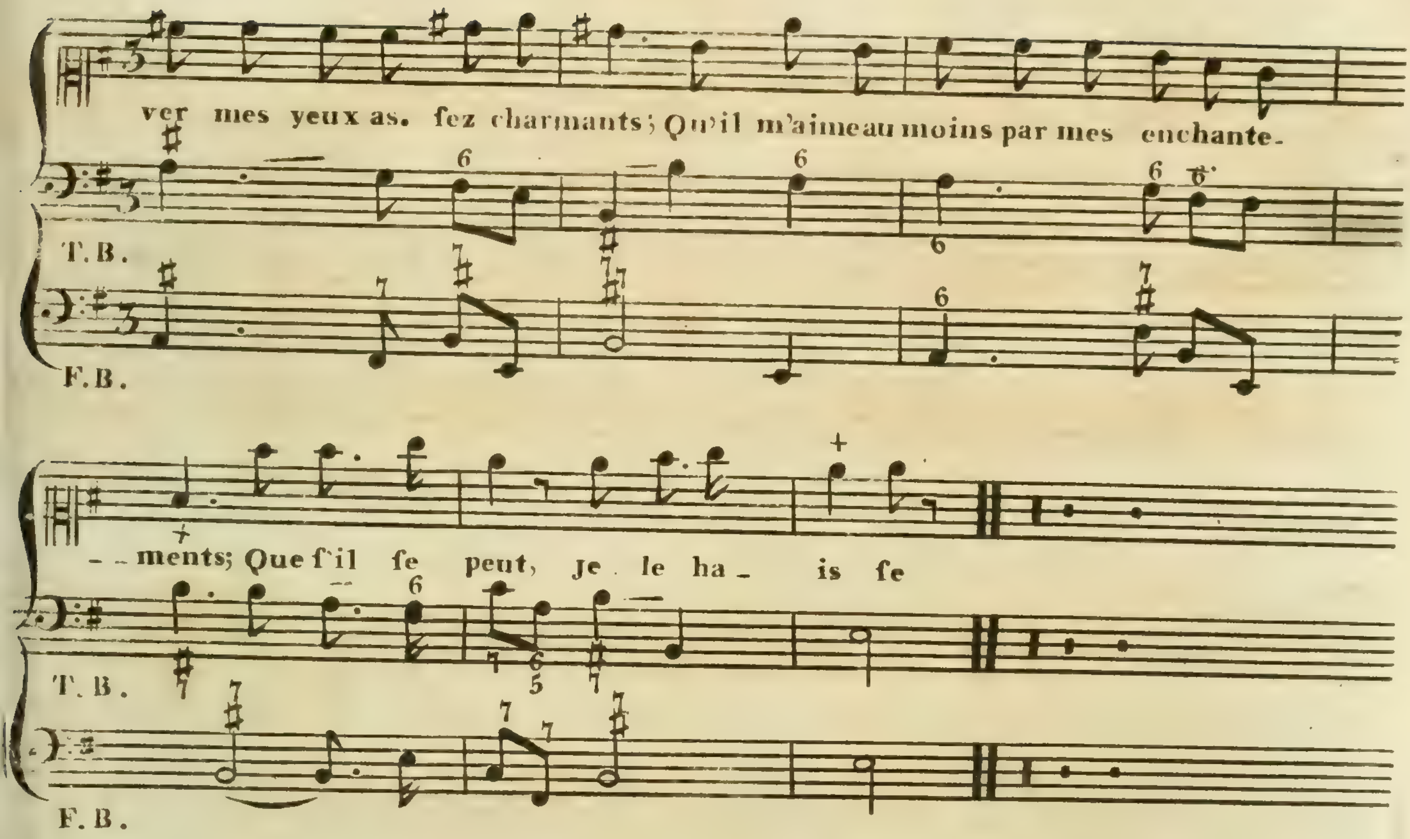

vage; Qu'il eprouve toute ma rage Quel trouble me faiſit! Qui me fait héſi _ _
Th. B.
F. B.
_ _ ter. Queſtce quén ſa fa _ _ _ veur la pilie me veut di re Frapons, Ciel! qui peut márrê
Th. B.
F. B.
ter Achevons je fremis! Vengeons nous je ſoû pire! Eſt ce ainſi que je
Th. B.
F. B.


dois me venger anjour d'huy! Ma co_le_re_se' teint Quand j'aproche de luy
Th.B.
F.B.
Plus je le vois! plus ma vengeance est vaine; Mon bras tremblant se re:
Th.B.
F.B.
fuse à ma haine: Ah! quelle oruau te de luy ra vir le jour! A ce jeune He
Th.B.
F.B.

MUSIC


ros, tout ce de ſur la terre: Qui croiroit qu'il fût ne ſeulement pour la guerre, Il
Th. B.
F.B.
ſemble être fait pour l'Amour Ne puis je me ven ger á moins qu'il ne pe
Th.B.
F.B.
riſſe. Hé! ne ſuffi_t_il pas que l'Amour le pu niſſe. Puiſqu'il n'a pu trou
Th.B.
F.B.

MUSIC.


ver mes yeux aſ- ſez charmants; Qu'il m'aime au moins par mes enchante-
T.B.
F.B.
- - ments; Que ſ'il ſe peut, je le ha - is ſe
T.B.
F.B.

Tranſlation. Intended to give ſuch Readers as do not underſtand French, an idea of the Song.

At length the victim in my power I ſee,
This fatal year reſigns him to my rage;
Subdued by ſleep he lies, and leaves me free,
With chaſtening hand my fury to aſſwage.
That mighty heart invincible and fierce,
Which all my captives free'd from ſervile chains;
That mighty heart, my vengeful hand ſhall pierce;
My rage inventive wanton in his pains.
Ha! in my ſoul what perturbation reigns!
What? would compaſſion in his favour plead!
Strike, hand. O heaven! what charm thy force reſtrains?
Obey my wrath. I ſigh; yet let it bleed.
And is it thus my juſt revenge improves
The fair occaſion to chaſtize my foe?
As I approach, a ſofter paſſion moves,
And all my boaſting fury melts in wo.
Trembling, relax'd, and faithleſs to my hate,
The dreadful taſk this coward arm declines.
How cruel thus to urge his inſtant fate,
Depriv'd of life amid his great deſigns!
In youth how blooming! what a heavenly grace,
Thro' all his form, reſiſtleſs power diſplays!
How ſweet the ſmile that dwells upon his face,
Relentleſs rage diſarming whilſt I gaze!
Tho' to the proweſs of his conquering arms
Earth ſtood with all her hoſts oppoſed in vain;
Yet is he form'd to ſpread more mild alarms,
And bind all nature in a ſofter chain.
Can then his blood, his precious blood alone
Extinguiſh all the vengeance in my heart?
Tho' ſtill ſurviving, might he not atone.
For all the wrongs, I feel, by gentler ſmart?
Since all my charms, unfeeling, he defies,
Let Magic force his ſtubborn ſoul ſubdue;
Whilſt I, inflexible to tears and ſighs,
With hate (if I can hate) his peace purſue.

and ſo capacious, that young foxes often ſhelter themſelves in the hollow of ſuch as by accident fall off in the deſerts. See Ovis.

MUSIS (Agoſtino de), a noted engraver, better known by the name of *Agoſtino Veneziano*, or in England by that of "Auguſtin the Venetian;" but *Muſis* was his proper family name. He was a native of Venice, and ſcholar of Marc Antonio Raimondi. It is not certain at what period he began his ſtudies under that celebrated maſter; but the firſt dated print by Agoſtino appeared A. D. 1509, at which time, it is probable, his tutor ſtill reſided at Venice. After the death of Raphael, which happened in 1520, Agoſtino de Muſis, and Marc de Ravenna, his fellow-diſciple, who had conjointly aſſiſted each other, ſeparated, and worked entirely upon their own account. It is uncertain at what time Agoſtino died; but his prints are not dated latter than 1536. So that it may be reaſonably ſuppoſed that he did not long ſurvive that period. Agoſtino de Muſis imitated the ſtyle of his maſter with great attention, and was, upon the whole, the moſt ſucceſsful of all his ſcholars. In neatneſs and mechanical execution with the graver, he has often equalled if not ſometimes exceeded him; but in point of taſte, and in the purity and correctneſs of outline, he certainly fell greatly ſhort of him. Agoſtino's drawing had more of manner and ſtiffneſs; the heads of his figures are not ſo accurately marked; nor the other extremities expreſſed with equal truth.

MUSIVUM AURUM. See CHEMISTRY, n° 1224.

MUSK, a very ſtrong-ſcented ſubſtance found under the belly of an Eaſt Indian animal. See MOSCHUS.

According to Tavernier, the beſt and greateſt quantities of muſk come from the kingdom of Boutan, from whence it is carried for ſale to Patna, the chief town of Bengal. After killing the animal, the peaſants cut off the bag, which is about the ſize of an egg, and is ſituated nearer the organs of generation than the navel. They next take out the muſk, which has then the appearance of clotted blood. When they want to adulterate it, they put a maſh of the animal's blood and liver into the place of the muſk they had extracted. In two or three years this mixture produces certain ſmall animals which eat the good muſk; ſo that, when opened, a great conſumption is perceived. Others, after extracting a portion of the muſk, put in ſmall pieces of lead to augment the weight. The merchants who tranſport the muſk to foreign countries are leſs averſe to this trick than the former; becauſe in this caſe none of the animals abovementioned are produced. But the deceit is ſtill worſe to diſcover, when, of the ſkin taken from the belly of a young animal, they make little bags, which they ſew ſo dexterouſly with threads of the ſame ſkin, that they reſemble genuine bags. Thoſe they fill with what they take out of the genuine bags, and ſome fraudulent mixture, which it is extremely difficult for the merchants to detect. When the bags are ſewed immediately on their being cut, without allowing any part of the odour to diſſipate in the air, after they have abſtracted as much of the muſk as they think proper, if a perſon applies one of theſe bags to his noſe, blood will be drawn by the mere force of the odour, which muſt neceſſarily be weakened or diluted in order to render it agreeable without injuring the brain. Our author brought one of the animals with him to Paris, the odour of which was ſo ſtrong, that it was impoſſible for him to keep it in his chamber. It made every head in the houſe giddy; and he was obliged to put it in a barn, where the ſervants at laſt cut away the bag: the ſkin, notwithſtanding, always retained a portion of the odour. The largeſt muſk-bag ſeldom exceeds the ſize of a hen's egg, and cannot furniſh above half an ounce of muſk; three or four of them are ſometimes neceſſary to afford a ſingle ounce. In one of his voyages to Patna, Tavernier purchaſed 1663 bags, which weighed 1557 ounces and a half; and the muſk, when taken out of the bags, weighed 452 ounces.

Muſk affords the ſtrongeſt of all known odours. A ſmall bit of it perfumes a large quantity of matter. The odour of a ſmall particle extends through a conſiderable ſpace. It is likewiſe ſo fixed and permanent, that at the end of ſeveral years it ſeems to have loſt no part of its activity. When it comes to us, it is dry, with a kind of unctuoſity, of a dark reddiſh brown or ruſty blackiſh colour, in ſmall round grains, with very few hard black clots, and perfectly free from any ſandy or other viſible foreign matter. If chewed, and rubbed with a knife on paper, it looks ſmooth, bright, yellowiſh, and free from bitterneſs. Laid on a red hot iron, it catches flame, and burns almoſt entirely away, leaving only an exceeding ſmall quantity of light greyiſh aſhes: if any earthy ſubſtances have been mixed with the muſk, the quantity of the reſiduum will readily diſcover them.

Muſk has a bitteriſh ſubacrid taſte; a fragrant ſmell, agreeable at a diſtance, but when ſmelt near to, ſo ſtrong as to be diſagreeable unleſs weakened by the admixture of other ſubſtances. If a ſmall quantity be infuſed in ſpirit of wine in the cold for a few days, it imparts a deep, but not red tincture: this, though it diſcovers no great ſmell of the muſk, is nevertheleſs ſtrongly impregnated with its virtues; a ſingle drop of it communicates to a whole quart of wine a rich muſky flavour. The degree of flavour which a tincture drawn from a known quantity of muſk communicates to vinous liquors, is perhaps one of the beſt criteria for judging of the goodneſs of this commodity. Neumann informs us, that ſpirit of wine diſſolves 10 parts out of 30 of muſk, and that water takes up 12: that water elevates its ſmell in diſtillation, whilſt pure ſpirit brings over nothing.

Muſk is a medicine of great eſteem in the eaſtern countries; among us, it has been for ſome time pretty much out of uſe, even as a perfume, on a ſuppoſition of its occaſioning vapours, &c. in weak females and perſons of a ſedentary life. It appears, however, from late experience, to be, when properly managed, a remedy of good ſervice even againſt thoſe diſorders which it has been ſuppoſed to produce. Dr Wall has communicated (in the Philoſoph. Tranſac. n° 474.) an account of ſome extraordinary effects of muſk in convulſive and other diſeaſes, which have too often baffled the force of medicine. The doctor obſerves, that the ſmell of perfumes is often of diſſervice, where the ſubſtance, taken inwardly and in conſiderable quantity produces the happieſt effects; that two perſons, labouring under a *ſubſultus tendinum*, extreme anxiety, and want of ſleep, from the bite of a mad dog, by taking two doſes of muſk, each of which was 16 grains, were perfectly relieved from their complaints. He likewiſe obſerves, that convulſive hiccups, attended with the worſt ſymptoms, were removed by a doſe or two of 10 grains; and that in ſome caſes, where this medicine could not, on account of ſtrong convulſions, be adminiſtered to the patient by the mouth, it proved of ſervice when injected as a clyſter. He likewiſe adds, that under the quantity of ſix grains, he never found much effect from it; but that, taken to 10 grains and upwards, it never fails to produce a mild diaphoreſis, without at all heating or giving any uneaſineſs: that, on the contrary, it eaſes pain, raiſes the ſpirits; and that, after the ſweat breaks out, the patient uſually falls into a refreſhing ſleep: that he never met with any hyſterical perſon, how averſe ſoever to perfumes, but could take it, in the form of a bolus, without inconvenience. To this paper is annexed an account of ſome farther extraordinary effects of muſk, obſerved by another gentleman. Repeated experience has ſince confirmed its efficacy in theſe diſorders. The doſe has ſometimes been increaſed, particularly in convulſive diſorders, to the quantity of a ſcruple or half a dram every three or four hours, with two or three ſpoonfuls of muſk julep between. The julep is the only officinal preparation of it. It is combined with opium in tetanus, and with mercury in rabies canina.

Musk-Animal. See Moschus.

Musk-Ox. See Bos.

Musk-Rat, in zoology. See Castor.

MUSKET, or Musquet, properly a fire-arm borne on the ſhoulder, and uſed in war; to be fired by the application of a lighted match.

The length of the barrel is fixed to three feet eight inches from the muzzle to the touch-pan, and its bore is to be ſuch as may receive a bullet of 14 in a pound, and its diameter differs not above one 50th part from that of the bullet.

Muſkets were anciently borne in the field by the infantry, and were uſed in England ſo lately as the beginning of the civil wars. At preſent they are little uſed except in the defence of places, fuſees or firelocks having taken their place and name.

MUSKETOON, a kind of ſhort thick muſket, whoſe bore is the 38th part of its length: it carries five ounces of iron, or ſeven and a half of lead, with an equal quantity of powder. This is the ſhorteſt kind of blunderbuſſes.

MUSLIN, a fine ſort of cotton cloth, which bears a downy knot on its ſurface. There are ſeveral ſorts of muſlins brought from the Eaſt Indies, and more particularly from Bengal; ſuch as doreas, beteiles, mulmuls, tanjecbs, &c. Muſlin is now manufactured in Britain, and brought to very great perfection.

MUSONIUS, (Caius Rufus), a Stoic philoſopher of the ſecond century, was baniſhed into the iſland of Gyare, under the reign of Nero, for criticiſing the manners of that prince; but was recalled by the emperor Veſpaſian. He was the friend of Apollonius Tyaneus, and the letters that paſſed between them are ſtill extant.

MUSQUETOE. See Culex.

MUSSULMAN, or Musylman, a title by which the Mahometans diſtinguiſh themſelves; ſignifying, in the Turkiſh language, "true believer, or orthodox." See Mahometanism.

In Arabic, the word is written *Moſlem*, *Moſleman*, or *Moſliman*. The appellation was at firſt given to the Saracens, as is obſerved by Leunclavius.—There are two kinds of Muſſulmans, very averſe to each other; the one called *Sonnites*, and the other *Shiites*.—The Sonnites follow the interpretation of the Alcoran given by Omar; the Shiites are the followers of Ali. The ſubjects of the king of Perſia are Shiites; and thoſe of the grand ſignior, Sonnites. See Sonna, and Alcoran.

Some authors will have it, that the word Muſſulman ſignifies *ſaved*, that is, predeſtinated; and that the Mahometans give themſelves the appellation, as believing they are all predeſtinated to ſalvation.—Martinius is more particular as to the origin of the name; which he derives from the Arabic מסלם, *muſalem*, "ſaved, ſnatched out of danger:" the Mahometans, he obſerves, eſtabliſhing their religion by fire and ſword, maſſacred all thoſe who would not embrace it, and granted life to all that did, calling them *Muſſulmans*, q. d. *erepti è periculo*; whence the word, in courſe of time, became the diſtinguiſhing title of all thoſe of that ſect, who have affixed to it the ſignification of *true believers*.

MUST, Mustum, ſweet wine newly preſſed from the grape; or the new liquor preſſed from the fruit before it has worked or fermented. See Wine.

Must of Rheniſh wine. This is a liquor that, tho' drank by ſome, is found extremely to affect the brain; for not having paſſed the natural effervеſcence which it would have been ſubject to, in the making of wine, its ſalts are locked up till the heat of the ſtomach ſetting them to work, they raiſe their effervеſcence there, and ſend up abundance of ſubtle vapours to the brain. The Rheniſh muſt is of two kinds, being made either with or without boiling. That made without boiling is only put up ſo cloſe in the veſſel that it cannot work; this is called *ſtumm-wine*. That by boiling is thus prepared: they take ſtrong veſſels not quite filled, and putting them into a cellar, they make a fire mild at firſt, but increaſed by degrees, and afterwards they gradually leſſen it again, that the boiling may ceaſe of itſelf. This operation is finiſhed in 36 or 40 hours, according to the ſize of the veſſel; and the wine-boilers, inſtead of common candles, which would melt by the heat, uſe thin pieces of ſplit beech-wood. Theſe alſo ſerve for a double purpoſe; not only lighting them, but giving them notice of the boiling being enough; before that time, the quantity of vapours thrown up make them burn dim; but as ſoon as it is finiſhed, the vapours aſcend in leſs quantity, and the lights burn briſk and clear. About ſeven or eight days after this boiling, the muſt begins to work, and after this working it is called *wine*. They have alſo another kind of Rheniſh muſt which is thus prepared: they boil the liquor to half the quantity, and put into it the medicinal ingredients they are moſt fond of; ſuch as orange peel, elecampane-root, and Juniper-berries, or the like; being thus medicated, the whole works much more ſlowly than it otherwiſe would.—If the boiled muſt, by too violent an effervеſcence, caſt out its lees, it will on this become vapid and dead, unleſs this ſeparation is ſtopped by ſome fatty ſubſtance, ſuch as freſh butter or the like: they put this in upon a vine leaf, or elſe apply hard to the mouth of the veſſel.

A muſt for artificial wine may be thus made: Take 20 pounds of fine ſugar, five gallons of water, four ounces of white tartar finely pulveriſed, or cream of tartar, and boil them in a large veſſel over a gentle fire.

MUSTARD. See Sinapi.

Mustard Seed, is one of the ſtrongeſt of the pungent, ſtimulating, diuretic medicines, that operate without exciting much heat. It is ſometimes, taken unbruiſed, to the quantity of a ſpoonful at a time, in paralytic, cachectic, and ſerous diſorders. It is applied alſo as an external ſtimulant, to benumbed and paralytic limbs: to parts affected with fixed rheumatic pains: and to the ſoles of the feet, in the low ſtate of acute diſeaſes, for raiſing the pulſe; in this intention, a mixture of equal parts of the powdered ſeeds and crumbs of bread, with the addition ſometimes of a little bruiſed garlic, are made into a cataplaſm with a ſufficient quantity of vinegar. See Sinapism.

Muſtard-ſeed yields upon expreſſion, a conſiderable quantity of oil, which is by ſome recommended externally againſt rheumatiſms and palſies, though it has nothing of that quality by which the ſeeds themſelves prove uſeful in thoſe diſorders; the oil being mild and inſipid as that of olives, and the pungency of the ſeed remaining entire in the cake left after expreſſion; nor is any conſiderable part of the pungent matter extracted by rectified ſpirit. The bruiſed ſeeds give out readily to water nearly the whole of their active matter: added to boiling milk they curdle it, and communicate their pungency to the whey. The powder of muſtard-ſeed may be made into the conſiſtence of a loch with warm water, in which a little ſea ſalt has been diſſolved. Of this a common-ſpoonful, ſometimes two, diluted with tepid water, are given on an empty ſtomach: it operates as well as an emetic, and proves an excellent remedy in moſt nervous diſorders, according to Dr Monro, in Med. Eſſ. Edinb. vol. ii. art. 19. p. 303. note.

MUSTELA, the Otter and Weasel; a genus of quadrupeds of the order of feræ. There are ſix cutting teeth in each jaw; thoſe of the upper jaw, erect, ſharp-pointed, and diſtinct: of the lower jaw, blunter, huddled together, and two placed within the line of the reſt: The tongue is ſmooth.

Plate CCCXXXIII.

1. The lutris, or ſea-otter, having hairy feet and a hairy tail. The length from noſe to tail is about three feet long, and the tail is about 13 inches; the body and the limbs are black, except the fore part of the head, which is white or grey; the largeſt individual weighs from 70 to 80 pounds; the fur is very thick, long, black, and gloſſy, ſometimes varying to ſilvery, with a ſoft down beneath. The ſea-otter inhabits the coaſts of North-weſt America and Eaſtern Aſia, and the intermediate iſlands. It lives moſtly in the ſea, and ſwims with great facility: frequenting the ſhallows which abound in ſea weeds, and feeding on lobſters, fiſh, *ſepiæ* or cuttle fiſh, and ſhell-fiſh. It is a harmleſs animal; very affectionate to its young, inſomuch, that it will pine to death at the loſs of them, and die on the very ſpot where they have been taken from it. Before the young can ſwim, the dams carry them in their paws, lying in the water on their backs: they ſwim often on their back, their ſides, and even in a perpendicular poſture; are very ſportive: embrace and kiſs each other; they breed but once a-year, and have but one young at a time, ſuckle it for a year, and bring it on ſhore. They are dull ſighted, but quick ſcented: and run very ſwiftly on land. They are hunted for their ſkins, which are of great value: being ſold to the Chineſe for 70 or 80 rubles a-piece: each ſkin weighs 3½ lib. The young are reckoned very delicate meat, ſcarce to be diſtinguiſhed from a ſucking lamb. The cry of this creature is nearly ſimilar to a young dog; and it is ſometimes interrupted by another cry ſimilar to that of the ſaki or fox-tailed monkey. It may be nouriſhed with the flour of manioc diluted in water.

2. The lutra, or common otter, has naked feet, and the tail is about half the length of the body. It is in general about two feet long, from the tip of the noſe to the baſe of the tail. The fur is of a deep brown colour, with two ſmall white ſpots on each ſide of the noſe, and one beneath the chin. This animal inhabits Europe, North America, and Aſia as far ſouth as Perſia. It frequents freſh water rivers, lakes, and fiſh-ponds; and preys on fiſh, frogs, and freſh-water cruſtaceous animals, being exceedingly deſtructive to fiſh ponds. The otter procreates in February, and the female brings forth three or four young ones in May: the male calls the female by a ſoft murmuring noiſe. The otter ſhows great ſagacity in forming its habitation; it burrows under ground on the banks of ſome river or lake: it always makes the entrance of its hole under water; working upwards to the ſurface of the earth and forming, before it reaches the top, ſeveral holes or lodges, that in caſe of high floods, it may have a retreat; for no animal affects lying drier at top: it makes a minute orifice for the admiſſion of air. It is further obſerved, that this animal, the more effectually to conceal its retreat, contrives to make even this little air-hole in the middle of ſome thick buſh. Our author alſo informs us, that the otter is capable of being tamed; that he will follow his maſter like a dog, and even fiſh for him, and return with his prey. Though the otter does not caſt his hair, his ſkin is browner, and ſells dearer in winter than in ſummer; and makes a very fine fur. His fleſh has a diſagreeable fiſhy taſte. His retreats exhale a noxious odour from the remains of putrid fiſhes: and his own body has a bad ſmell. The dogs chace the otter ſpontaneouſly, and eaſily apprehend him when at a diſtance from water or from his hole. When ſeized, he defends himſelf, bites the dogs furiouſly, and ſometimes with ſuch force as to break their legbones, and never quits his hold but with life. The beaver, however, who is not a very ſtrong animal, purſues the otter, and will not allow them to inhabit the ſame banks with himſelf.

3. The lutreola, or ſmall otter, has very broad hairy feet, and a white mouth; [illegible] a foot in length. [illegible] together: [illegible] long, [illegible] black. This animal inhabits Poland, Finland, [illegible], and Sileſia: frequenting rivers, ponds, and pools.

on fiſh and frogs. It is caught with dogs and traps, and is exceſſively fœtid; but its fur is very valuable, being eſteemed next in beauty to that of the ſable.

Plate cccxxxii.

4. The canadenſis, or Canadian otter, is of a black colour, and the fur is ſmooth. It has a long taper tail: and inhabits Canada and other parts of North America.

5. The guianenſis, or ſmall Guiana otter, with the hind feet webbed, the toes of the fore-feet unconnected, and a long taper naked tail inhabits Cayenne. and probably other parts of South America. It is only about ſeven inches long from the noſe to the rump; the tail is near ſeven; the upper parts of the head and body are marked with large browniſh black ſpots, exactly correſponding on both ſides, and the intervals are of a yellowiſh grey colour; all the under parts of the body and head, and the fore-parts of the fore-legs are white, and there is a white ſpot over each eye: the ears are large and round; and the mouth is garniſhed with long whiſkers. Buffon informs us that there are three ſpecies of otters in Cayenne: 1ſt, Black, which weighs from 40 to 50 French pounds. 2d, Yellowiſh, weighing 20 or 25 pounds. 3d, The ſmall greyiſh kind above deſcribed; which only weighs three or four pounds. The other two are not deſcribed; but they are ſaid to appear in numerous troops, to be very fierce and dangerous, and to defend themſelves againſt dogs, biting very cruelly: they litter in holes which they dig on the banks of rivers; are often tamed and brought up in houſes.

The otters, of which there are ſeveral more ſpecies deſcribed by authors, are diſtinguiſhed from the following tribe, the *weaſels*, by having their feet palmated or webbed; whereas the latter have their toes ſeparate, or unconnected by any web or membrane.

1. The galera, tayra, or Guinea weaſel, is of an uniform duſky colour, the fur very rough. It is about the ſize of a rabbit, and is ſhaped like a rat. It inhabits Guinea; where it burrows in the ground by means of its fore feet, which are ſtrong and formed for digging. It is very common about the negro villages, and is exceedingly fierce and deſtructive to poultry.

2. The foina, or common martin, is of a blackiſh cheſnut colour, with the throat and breaſt white: the head and body meaſure 18 inches in length, the tail 10. The martin inhabits Britain, Germany, France, and moſt parts of the ſouth of Europe, and even the warmer parts of Ruſſia. He lives in woods, and goes about during the night in queſt of prey, He is a moſt elegant lively animal. His movements are all exceedingly nimble; he rather bounds and leaps than walks. He climbs rough walls with eaſe and alacrity; enters the pigeon or hen houſes, eats the eggs, pigeons, fowls, &c. and the female often kills great numbers, and tranſports them to her young. He likewiſe ſeizes mice, rats, moles, and birds, in their neſts. M. Buffon kept one of theſe animals for a conſiderable time. He tamed to a certain degree, but never formed any attachment, and continued always ſo wild, that it was neceſſary to chain him. He made war againſt the rats, and attacked the poultry whenever they came in his way. He often got looſe, though chained by the middle of the body. At firſt he went to no great diſtance, and returned in a few hours; but without diſcovering any ſymptoms of joy or affection to any particular perſon. He, however, called for victuals like a cat or dog. Afterwards he made longer excurſions; and at laſt he thought proper never to return. He was then about a year and a half old ſeemingly the age at which nature aſſumes her full aſcendency. He eat every thing preſented to him, except ſallad and herbs; was fond of honey, and preferred hemp-ſeed to every other grain. It was remarked that he drank very often; that he ſometimes ſlept two days ſucceſſively, and at other times would ſleep none for two or three days; that before ſleeping, he folded himſelf in a round form, and covered his head with his tail; and that, while awake, his motions were ſo violent, ſo perpetual, and ſo incommodious, that though he had not diſturbed the fowls, it was neceſſary to chain him, to prevent him from breaking every thing. The ſame author informs, that he has had in his poſſeſſion ſeveral martins of a more advanced age, which had been taken in nets: but they continued to be totally ſavage, bit all who attempted to touch them, and would eat nothing but raw fleſh. The character of this animal is ſomewhat differently given by Mr Pennant: who ſays "it is very *good-natured*, ſportive, and capable of being *tamed*." The younger females bring three or four at a birth; when older, they produce ſix or ſeven. They breed in hollows of trees; and are often, in winter, found in magpies neſts. The ſkin and excrements have a muſky ſmell.

3. The martes, or pine-martin, has the body of a dark or blackiſh cheſnut colour, the breaſt and throat yellow. It inhabits the north of Europe, Aſia, and America; and is more rarely found in Britain, France, Germany, and Hungary; and as far as Tonquin and China. They live in large woods or foreſts, keeping in the day-time in the hollows of trees, occupying ſquirrels neſts, eſpecially for their young, and go about only by night. They prey on ſquirrels, mice, rats, and ſmall birds; eat likewiſe berries, ripe fruit, and honey; and, in winter, go in queſt of pigeons, and poultry. They procreate in February; and the female is ſaid, after nine months, to bring forth ſeven or eight young ones. The head of this ſpecies is ſhorter, and the legs are ſomewhat longer, than in the common martin. The fur is far ſuperior in fineneſs to that of the common kind, and is a prodigious article in commerce: Thoſe about Mount Caucaſus, with an orange throat, are more eſteemed by furriers than the reſt.

4. The Guiana or South American martin, is of a dark brown colour, with a white forehead, and a long narrow ſtripe along the ſide of the neck. The body and head are near two feet long, and the tail is only about five inches. It inhabits Guiana,

5. The laniger, woolly weaſel, or ſmall Guiana martin, is covered with white woolly hair, and has a long taper tail: the body and head are near 16 inches long, and the tail near 9. It inhabits Cayenne.

6. The zibellina, or ſable, has a great reſemblance to the martin; from which it differs in having a longer head; longer ears, ſurrounded by a yellow margin: longer and more elegant fur; the feet more thickly clothed with hair; and the tail ſhorter than the hind-legs when extended, while that of the martin is much longer. The colour of the hair is cinerous at the bottom, and black at the tips; the chin is cinerous, ſometimes white, yellowiſh, or ſpotted; the mouth is garniſhed with long whiſkers; and the feet are large, with white claws. It inhabits the northern parts of

Aſia and America, Siberia, Kamtſchatka, and the Kurile iſlands, and formerly in Lapland; being found in Aſia as low as 58°, and in America even to 40° of latitude. The ſables frequent the banks of rivers and the thickeſt parts of the woods: avoiding the rays of the ſun, which are ſaid in a ſhort time to change the colour of their hair. They live in holes of the earth, or beneath the roots of trees: ſometimes they will form neſts in the trees, and ſkip with great agility from one to the other: they are very lively, and much in motion during the night. Gmelin tells us, that after eating, they generally ſleep half an hour or an hour, when they may be puſhed, ſhaken, and even pricked, without awaking. During the night they are exceſſively active and reſtleſs. A tame one kept by Gmelin was acuſtomed to riſe upon its hind-legs on ſight of a cat, in order to prepare for the combat: In the woods they are much infeſted by wild cats. During ſummer the ſables prey on ermines, weaſels, and ſquirrels, but eſpecially on hares; in winter, on birds; in autumn, on whortleberries, cranberries, and the berries of the ſervice-tree; but during this laſt ſeaſon their ſkins are at the worſt; that diet cauſing their ſkins to itch, and to rub off their fur againſt the trees. They bring forth at the end of March or beginning of April; and have from three to five at a time, which they ſuckle for four or five weeks. In ſpring, after ſhedding the coat, the fur is ſometimes of a tawny caſt, and ſometimes varies to ſnowy whiteneſs. The blackeſt are reputed the beſt; and ſometimes ſell even in Siberia, from one to ten pounds Sterling each. See the article SABLE.

Plate CCCXXXIII. 7. The putorius, or pole-cat, is of a dirty yellow colour, with white muzzle and ears. He inhabits moſt parts of Europe, and in the temperate climates of Aſiatic Ruſſia; and has a great reſemblance to the martin in temperament, manners, diſpoſition, and figure. Like the latter, he approaches our habitations, mounts on the roofs, takes up his abode in hay-lofts, barns, and unfrequented places, from which he iſſues during the night only in queſt of prey. He burrows under ground, forming a ſhallow retreat about two yards in length, generally terminating unde the roots of ſome large tree. He makes greater havock among the poultry than the martin, cutting of the head of all the fowls, and then carrying them off one by one to his magazine. If, as frequently happens, he cannot carry them off entire, on account of the ſmallneſs of the entry to his hole, he eats the brains, and takes only the heads along with him. He is likewiſe very fond of honey, attacks the hives in winter, and forces the bees to abandon them. The females come in ſeaſon in the ſpring; and bring forth three, four, or five at a time. In the deſarts of Aſiatic Ruſſia, pole-cats are ſometimes found, eſpecially in winter, of a white colour; they are likewiſe found beyond lake Baikal with white or yellowiſh rumps, bounded with black. It is exceedingly fetid, like ſeveral other ſpecies of this genus, eſpecially the martin and ſable, giving out from the anus a moſt offenſive vapour when frightened. The male is moſtly of a yellowiſh tinge, having a whitiſh muzzle, while the muzzle of the female is commonly of a yellowiſh dirty white.

8. The furo, or ferret, has red and fiery eyes; the colour of the whole body is of a very pale yellow; the length from noſe to tail is about 14 inches, the tail five. In its wild ſtate it inhabits Africa: from thence it was brought into Spain, in order to free that county from multitudes of rabbits with which it was over run; and from Spain the reſt of Europe has been ſupplied. This creature is incapable of bearing the cold, and cannot ſubſiſt even in France unleſs in a domeſtic ſtate. The ferret is not in our climates endowed with the ſame capacity of finding his ſubſiſtence as other wild animals, but muſt be carefully nouriſhed within doors, and cannot exiſt in the fields; for thoſe who are loſt in the burrows of rabits never multiply, but probably periſh during the winter. Like other domeſtic animals, he varies in colour. The female ferret is leſs than the male; and when in ſeaſon, we are aſſured, ſhe is ſo extremely ardent, that ſhe dies if her deſires are not gratified. Ferrets are brought up in caſks or boxes, where they are furniſhed with beds of hemp or flax. They ſleep almoſt continually. Whenever they awake they ſearch eagerly for food; and bran, bread, milk, &c. are commonly given them. They produce twice every year; and the female goes ſix weeks with young. Some of them devour their young as ſoon as they are brought forth, inſtantly come again in ſeaſon, and have three litters, which generally conſiſt of five or ſix, and ſometimes of ſeven, eight, or nine. They are employed for hunting rabbits; and as in this country they are apt to degenerate, warreners are in uſe to croſs the breed, procuring an intercourſe between a female ferret and a male pole, by leaving the former, when in ſeaſon, near the haunts of the latter: The produce is of a much darker colour than the ferret, having a great reſemblance to the pole-cat. This animal is by nature a mortal enemy to the rabbit. Whenever a dead rabbit is for the firſt time preſented to a young ferret, he flies upon it, and bites it with fury; but if it be alive, he ſeizes it by the throat or the noſe, and ſucks its blood. When let into the burrows of rabbits, he is muzzled, that he may not kill them in their holes, but only oblige them to come out, in order to be caught in the nets. If the ferret is let in without a muzzle, he is in danger of being loſt: for, after ſucking the blood of the rabbit, he falls aſleep; and even ſmoking the hole is not acertain method of recalling him; becauſe the holes have often ſeveral entries which communicate with each other, and the ferret retires into one of thoſe when incommoded with the ſmoke. Boys likewiſe uſe the ferret for catching birds in the holes of walls, or of old trees. The ferret, though eaſily tamed, and rendered docile, is extremely iraſcible; his odour is always diſagreeable; but when he is irritated, it becomes much more offenſive. His eyes are lively, and his aſpect is inflammatory; all his movements are nimble; and he is at the ſame time ſo vigorous, that he can eaſily maſter a rabit, though at leaſt four times larger than himſelf.

9. The ſarmatica, or Sarmatian weaſel, is of a browniſh black colour, ſpotted and ſtriped irregularly with obſcure yellow, and is about 14 inches in length, excluſive of the tail, which is ſix inches in length. It reſembles the pole cat, but has a narrower head, a more lengthened body, a long tail, and ſhorter hair, except on the feet and tail; inhabits Poland, eſpecially Volhynia, in the deſerts of Ruſſia between the Volga and Tanais, the mountains of Caucaſus, Georgia, and Bucharia,

Mustela. death. This is a most [illegible] animal [illegible] of hammers, [illegible] birds, [illegible] animals. [illegible] brings forth from [illegible] eight young [illegible] own [illegible] those which have [illegible].

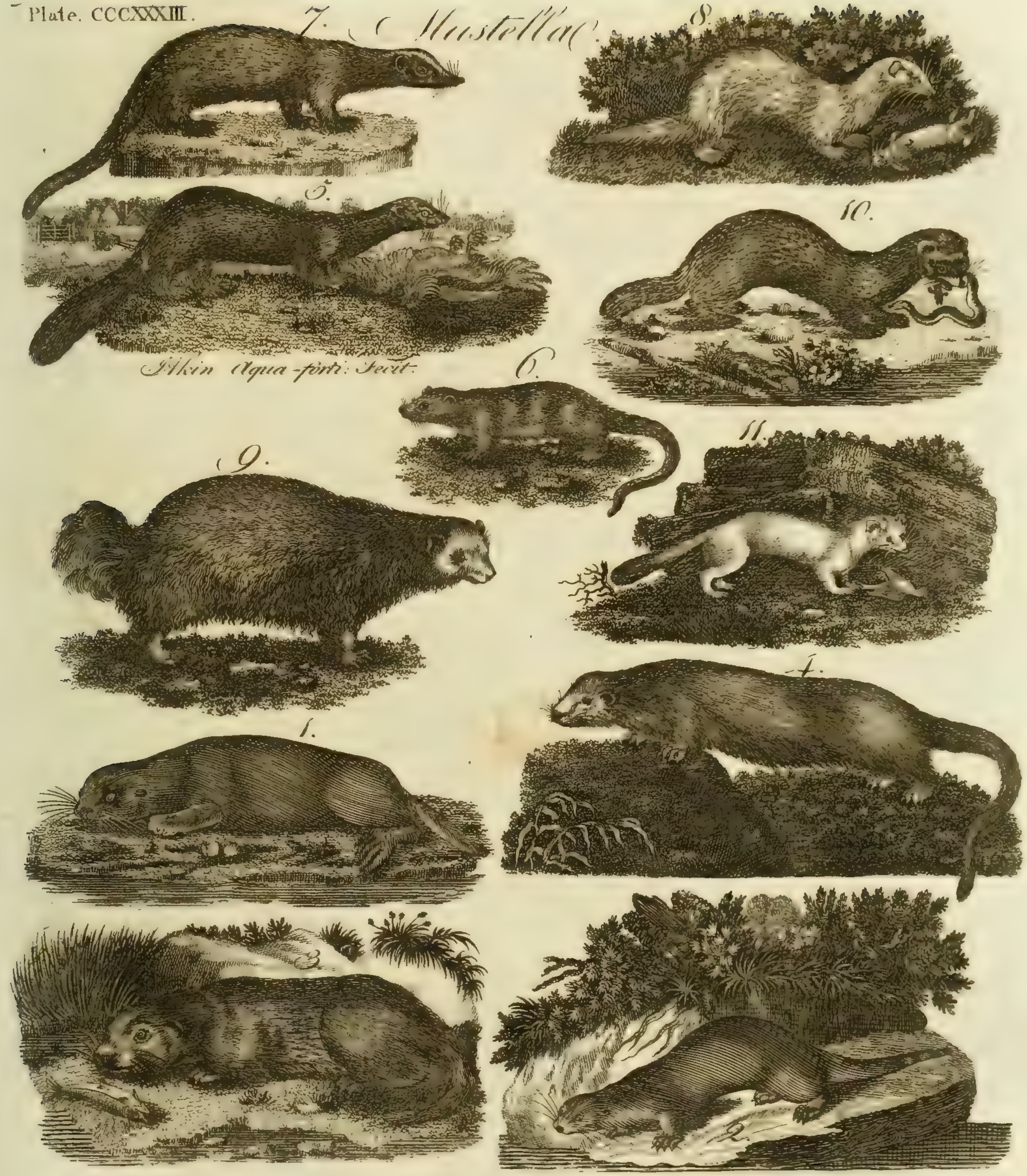
[illegible] 10. The Vulgaris, or common weasel, [illegible] or whitret, has the upper part of the body of a pale reddish brown; the lower parts white. It inhabits the temperate and northern parts of Europe, Asia, and America, and as far to the southward as the northern provinces of Persia, and is said to be found even in Barbary. In the more northern parts of Russia and Sweden, particularly in Westerbothnia, it becomes white in winter like the ermine; but even in this state it is easily distinguishable from the latter, being a great deal smaller; the body and head not exceeding seven inches long, and the tail two inches and a half. It is very destructive to young birds, poultry, and young rabbits; and is besides a great devourer of eggs. It does not eat its prey on the place; but, after killing it by one bite near the head, carries it off to its young or to its retreat. It preys also on moles, as appears by its being sometimes caught in the mole-traps. It is a remarkably active animal; and will run up the sides of walls with such ease, that scarce any place is secure from it; and the body is so small that there is scarce any hole but what is pervious to it.—This species is much more domestic than any of the rest, and frequents out-houses, barns, and granaries. It clears its haunt in a short time from mice and rats, being a much greater enemy to them than the cat itself. In summer, however, they retire farther from houses, especially into low grounds, about mills, along rivulets, concealing themselves among brush-wood, in order to surprise birds; and often take up their abode in old willows, where the female brings forth her young. She prepares for them a bed of straw, leaves, and other herbage, and litters in the spring, bringing from six to eight or more at a time. The young are born blind; but soon acquire sight and strength sufficient to follow their mothers. Their motion consists of unequal and precipitant leaps; and when they want to mount a tree, they make a sudden bound, by which they are at once elevated several feet high. They leap in the same manner when they attempt to seize a bird. These creatures, as well as the pole-cat and ferret, have a disagreeable odour, which is stronger in summer than in winter; and when pursued or irritated, their smell is felt at a considerable distance. They move always with caution and silence, and never cry but when they are hurt. Their cry is sharp, rough and very expressive of resentment. As their own odour is offensive, they seem not to be sensible of a bad smell in other bodies. M. Buffon informs us, that a peasant in his neighbourhood took three new-littered weasels out of the carcase of a wolf that had been hung upon a tree by the hind-feet. The wolf was almost entirely putrified, and the female weasel had made a nest of leaves and herbage for her young in the thorax of this putrid carcase. The weasel may be perfectly tamed, and rendered as caressing and frolicksome as a dog or squirrel. The method of taming them is to stroke them often and gently over the back; and to threaten, and even to beat them when they bite. [illegible] treated. They are fed with milk, boiled meat, and water.

Mustela. 11. The erminea, or ermine, has the tail tipt with black, and has been distinguished by authors into two varieties, the *stoat* and the ermine; though the difference seems chiefly to depend on climate and the season of the year; the stoat of a pale tawny brown or reddish yellow colour in summer, becoming the white ermine of winter in cold countries. They inhabit the north of Europe, Asia, and America, and as far as the northern parts of Persia and China; living in heaps of stones on the banks of rivers, in the hollows of trees, and particularly in forests, especially those of beech, preying on squirrels and lemmings. In summer and [illegible] the common weasel but [illegible] frequent houses, lurking chiefly in woods and hedges, especially such as border on brooks or rivulets. In general appearance it comes very near to the martin, but is shorter in the body, being scarcely ten inches long from nose to rump, and the tail about five and a half: the hair is likewise shorter and less shining than in that animal. In the northern regions, the fur of the ermine becomes entirely white during winter, except the outer half of the tail, which remains black. The skin is reckoned valuable, and sell in Siberia from two to three pounds Sterling a-hundred; but in ancient times it was in much greater request than now. In summer, the upper part of the body is of a pale tawny brown colour; the edges of the ears, and ends of the toes, are yellowish white; the throat, breast, and belly are white; in winter in the more temperate regions, it is sometimes mottled with brown and white; but in more severe winters becomes entirely white; the farther north and the more rigorous the climate, the white is the purer; those of Britain generally retain a yellowish tinge. In Persia and other more southern parts, it is brown the whole year. In Siberia they burrow in the fields, and are taken in traps baited with flesh. In Norway they are either shot with blunt arrows, or taken in traps made of two flat stones, one being propped up with a stick, to which is fastened a baited string, which when the animals nibble, the stone falls down and crushes them to death. The Laplanders take them in the same manner, only instead of stones make use of two logs of wood.

There are about 12 other species of the weasel tribe described by authors.—A Beautiful species of *weasel*, as it is called by some authors and universally considered by the Arabians, is described by Mr Bruce in his appendix under the name of *El Fennec*. It is about ten inches long from the snout to the tail; the tail near five inches and a quarter, and about half an inch of it black at the tip. From the point of the fore-shoulder to the point of the fore-toe it is two inches and seven eighths; from the occiput to the point of the nose, two inches and a half; and the ears are three inches and three eighths in length; and about an inch and a half in breadth, with the cavities very large. They are doubled and have a plait on the outside; the border of the inside is thick and covered with white soft hair, the middle part being bare and of a rose or pink colour. The pupil of the

Plate. CCCXXXIII.

Mustellae.



J. Akin Aqua-forti: Fecit.

Muſtela.

eye is large and black, ſurrounded with a deep blue iris; the muſtachoes are thick and ſtrong; the tip of the noſe is very ſharp, black, and poliſhed. There are four grinders on each ſide of the mouth, ſix fore-teeth in each jaw, and the upper jaw projected beyond the lower one. The canine teeth are large, long, and very ſharp pointed; the legs ſmall and the feet broad, with four toes armed with ſhort, black, ſharp retractile claws; thoſe on the fore-feet being ſharper than thoſe behind. The whole body of the animal is of a dirty white, approaching to cream-colour; the hair of the belly rather whiter, longer, and ſofter than the reſt, with a number of paps upon it.

Mr Bruce obtained one of theſe animals for two ſequins, by means of a janiſary, who had it from a Turkiſh foot-ſoldier juſt returned from Biſcara, a ſouthern diſtrict of Mauritania Cæſarienſis, now called the *Province of Conſtantina*. According to his account, they are not uncommon in this diſtrict, though more frequently to be met with in the neighbouring date-territories of Beni Mezab and Werglab, the reſidence of the ancient Melano-Gætuli. In the Werglab the animals are hunted for their ſkins, which are ſold at Mecca, and afterwards exported to India. Mr Bruce kept this one for ſeveral months at his country-houſe near Algiers, that he might learn its manners. Its favourite food he tells us was dates or other ſweet fruit, yet it is alſo very fond of eggs. It devoured thoſe of pigeons and ſmall birds with great avidity when firſt brought to him; but did not ſeem to know how to manage hen's eggs, though when they were broken to him he ate the contents with as great avidity as the others. When hungry, he would eat bread, eſpecially with honey or ſugar. His attention was greatly engroſſed by the ſight of any bird flying acroſs the room where he was, or confined in a cage near him, and could not be diverted from viewing it by placing biſcuit before him; ſo that it ſeems probable, that he preys upon them in his wild ſtate. He was extremely impatient of having his ears touched; ſo that it was with much difficulty that they could be meaſured; and, on account of this impatience, it was found impoſſible to count the protuberances or paps on his belly. He ſeemed very much frightened at the ſight of a cat; and endeavoured to hide himſelf, though he did not appear to meditate any defence. On this occaſion alſo he lowered his ears, which at other times he kept erect. Notwithſtanding his impatience, he would ſuffer himſelf, though with difficulty, to be handled in the day-time; but in the night he was extremely reſtleſs, always endeavouring to make his eſcape; and though he did not attempt the wire, yet with his ſharp teeth he would ſoon have made his way through a wooden one, as two others which they attempted to bring along with him actually did. Theſe animals are very ſwift of foot. They build their neſts in trees, particularly the palms, of which they eat the fruit; feeding alſo on locuſts and other inſects, and perhaps ſometimes preying upon ſmall birds. Mr Bruce has a long criticiſm on Dr Sparmann for pretending that one Mr Brander was the diſcoverer of this animal, whereas he ſays that he himſelf gave it to Mr Brander. This is the ſame animal with that formerly deſcribed as a ſpecies of Canis * under the name of *zerda*, and of which a figure is given in Plate CXX. Its exact place in the zoological ſyſtem has not yet been aſcertained.

*See Canis, nº xiv.

Muſtela | Mutilation.

MUSTER, in a military ſenſe, a review of troops under arms, to ſee if they be complete and in good order; to take an account of their numbers, the condition they are in, viewing their arms and accoutrements, &c.

Muster-Maſter-general, or *Comptroller-general of the Musters*; one who takes account of every regiment, their number, horſes, arms, &c. reviews them, ſees the horſes be well mounted, and all the men well armed and accoutred, &c.

Muster-Rolls, liſts of ſoldiers in each company, troop, or regiment, by which they are paid, and the ſtrength of the army is known.

MUTABILITY is oppoſed to immutability. See Immutability.

MUTATION, the act of changing, or ſometimes the change itſelf.

Mutation, in the ancient muſic, is applied to the changes or alterations that happen in the order of the ſounds which compoſe the melody.

MUTATIONES, among the Romans, poſt-ſtages, or places where the public couriers were ſupplied with freſh horſes.—The *mutationes* were wholly deſigned for the uſe of theſe couriers, or meſſengers of ſtate; in which reſpect they differ from *manſiones*.

MUTCHKIN, a liquid meaſure uſed in Scotland; it contains four gills, and is the fourth part of a Scotch pint.

MUTE, in a general ſenſe, ſignifies a perſon that cannot ſpeak, or has not the uſe of ſpeech.

Mute, in law, a perſon that ſtands dumb or ſpeechleſs, when he ought to anſwer, or to plead. See Arraignment.

Mute, in grammar, a letter which yields no ſound without the addition of a vowel. The ſimple conſonants are ordinarily diſtinguiſhed into mutes and liquids, or ſemi-vowels. See the articles Consonant, Liquid, &c.

The mutes in the Greek alphabet are nine, three of which, viz. π, κ, τ, are termed *tenues*; three β, γ, δ, termed *mediæ*; and three φ, χ, θ, termed *aſpiratæ*. See the article Aspirate, &c.

The mutes of the Latin alphabet are alſo nine, viz. B, C, D, G, J, K, P, Q, T.

MUTILATION, the retrenching or cutting away any member of the body.

This word is alſo extended to ſtatues and buildings, where any part is wanting, or the projecture of a member, as a cornice or an impoſt, is broken off. It is ſometimes alſo uſed in a more immediate manner for caſtration: (See Castration and Eunuch). The practice of this ſort of mutilation is of various kinds: The Hottentots are ſaid to cut away one teſticle from their children, upon ſuppoſition that they are thereby made lighter and more active for running. In other countries poor people completely mutilate their boys, to prevent the miſery and want which would attend their offspring. Thoſe who have nothing in view but the improvement of a vain talent, or the formation of a voice which disfigures nature, as was the caſe formerly in Italy, are contented with cutting away the teſticles. But in ſome countries of Aſia, eſpecially among the Turks and in part of Africa, this ſevere jealouſy inſpires with diſtruſt, would not think their wives ſafe in the cuſtody of ſuch eunuchs: They employ no ſlaves in their ſeraglios who have not been deprived of all the external parts of generation.

Amputation is not the only means of accompliſhing this end. Formerly, the growth of the teſticles was prevented, and their organization deſtroyed, by ſimple rubbing, while the child was put into a warm bath made of a decoction of plants. Some pretend that by this ſpecies of caſtration the life is in no danger. Amputation of the teſticles is not attended with much danger; but complete amputation of the external parts of generation is often fatal. This operation can only be performed on children from ſeven to ten years of age. Eunuchs of this kind, owing to the danger attending the operation, coſt in Turkey five or ſix times more than others. *Chardin* relates, that this operation is ſo painful and dangerous after 15 years of age, that hardly a fourth part of thoſe by whom it is undergone eſcape with life. *Pietro della Valle*, on the contrary, informs us, that in Perſia thoſe who ſuffer this cruel and dangerous operation as a puniſhment for rapes and other crimes of this kind, are eaſily cured though far advanced in life; and that nothing but aſhes is applied to the wound.

There are eunuchs at Conſtantinople, throughout all Turkey, and in Perſia, of a grey complexion: they come for the moſt part from the kingdom of Golconda, the peninſula on this ſide the Ganges, the kingdoms of Aſſau, Aracan, Pegu, and Malabar. Thoſe from the gulph of Bengal are of an olive colour. There are ſome white eunuchs who come from Georgia and Circaſſia, but their number is ſmall. The black eunuchs come from Africa, and eſpecially from Ethiopia. Theſe, in proportion to their horrible appearance, are the more eſteemed and coſt dearer. It appears that a very conſiderable trade is carried on in this ſpecies of men; for Tavernier informs us, that when he was in the kingdom of Golconda, in the year 1657, 22,000 eunuchs were made in it. In that country they are ſold at the fairs.

Eunuchs who have been deprived only of their teſticles, continue to feel a titillation in what remains, and to have the external ſign even more frequently than other men. But the part which remains is very ſmall, and continues almoſt in the ſame ſtate in which it was when the operation was performed during childhood.

If the different kinds of Eunuchs are examined with attention, it will be found almoſt univerſally, that caſtration and its conſequences have produced greater or leſs changes in their ſhape and appearance, independent of its phyſical effects.

Eunuchs, ſays Mr Withof, are timid, irreſolute, fearful, ſuſpicious, and unſteady: And this ſeems to hold generally, though not univerſally, or without exceptions; ſee the article Eunuch). The reaſon is, that their blood has not received all the neceſſary preparation in paſſing through the ſpermatic veſſels. Thus being deprived of the properties of males, they participate of the diſpoſitions of females, and their very ſoul is of an intermediate ſex. They are not, however, without advantages: They become larger and fatter than other men; but they ſometimes grow to a diſguſting ſize. Though oily ſubſtances are more abundant in eunuchs, they are likewiſe leſs ſubject to gout and to madneſs than men who have a greater quantity of blood and of ſplenetic humours. The abundant circulation of oily liquor prevents roughneſs or inequalities in the trachea or palate. This, joined to the flexibility of the epiglottis and of the other organs of the voice, makes it ſo ſonorous and extenſive, and at the ſame time ſo ſweet, that it is almoſt impoſſible for eunuchs to pronounce diſtinctly the letter R. Is this factitious advantage a ſufficient conſolation to theſe unhappy men for the barbarity of thoſe who have dared to ſacrifice nature at the ſhrine of avarice? It is impoſſible to reflect on all the motives for making eunuchs without a ſigh of pity and regret: and yet it moſt not be ſuppoſed that this abominable cruelty is always infallibly attended with that advantage which is ſometimes expected from it. Of 2000 victims to the luxury and extravagant caprices of the art, hardly three are found who unite good talents with good organs. The other languiſhing and inactive wretches, are outcaſts from both ſexes, paralytic members in the community, an uſeleſs burden upon the earth, by which they are ſupported and nouriſhed. But let us pay the tribute which is due to that virtuous pontiff Pope Clement VIII. who, liſtenng to the voice of modeſty and humanity, proſcribed and aboliſhed this deteſtable and infamous practice. Mutilation he declared was the moſt abominable and diſgraceful of crimes.

MUTILLA, in zoology, a genus of animals belonging to the order of inſecta hymenoptera. There are 10 ſpecies; the moſt remarkable of which is the occidentalis, or velvet ant, an inhabitant of North America. It has ſix legs, with ſhort crooked antennæ; the abdomen large, with a black liſt croſſing the lower part of it, and another black ſpot at the joining of the thorax; excepting which, the whole body and head reſembles crimſon-velvet. The trunk or ſhell of the body is of ſuch a ſtrong and hard contexture, that though trod upon by men and cattle they receive no harm. They have a long ſting in their tails, which cauſes inflammation and great pain for half an hour to thoſe who are ſtung by them; which uſually happens to negroes and others that go barefooted. They are moſtly ſeen running very nimbly on ſandy roads in the hotteſt ſummer-weather; and always ſingle. What they feed on, in what manner they breed, and where they ſecure themſelves in winter, is unknown.

MUTINA (anc. geog.) a noble city of the Ciſpadana, made a Roman colony in the ſame year with Parma, ſituated between the rivers Gabellus and Scultenna, on the Via Æmilia. Here D. Brutus, being beſieged by Antony, was relieved by the conſuls Hirtius and Panſa. The Greeks called it *Mutine;* except Polybius, in whom it is *Mutine;* and in Ptolemy *Mutina*, after the Roman manner.—Now *Modena*, a city of Lombardy, and capital of a cognominal duchy. E. Long. 11. 20. N. Lat. 44. 45

MUTINY, in a military ſenſe, to riſe againſt authority.—Any officer or ſoldier who ſhall preſume to uſe traiterous or diſreſpectful words againſt the State or Executive power.

"Any officer or ſoldier who ſhall behave himſelf with contempt or diſreſpect towards the general or other commander in chief of the forces, or ſhall ſpeak words tending to their hurt or diſhonour, is guilty of mutiny.

"Any officer or ſoldier who ſhall begin, excite, cauſe, or join in, any mutiny or ſedition, in the troop, company, or regiment, to which he belongs, or in any other troop or company in the ſervice, or on any party, poſt, detachment, or guard, on any pretence whatſoever, is guilty of mutiny.

"Any officer or ſoldier who, being preſent at any mutiny or ſedition, does not uſe his utmoſt endeavours to ſuppreſs the ſame, or coming to the knowledge of any mutiny, or intended mutiny, does not without delay give information to his commanding officer, is guilty of mutiny,

"Any officer or ſoldier who ſhall ſtrike his ſuperior officer, or draw, or offer to draw, or ſhall lift up any weapon, or offer any violence againſt him, being in the execution of his office, on any pretence whatſoever, or ſhall diſobey any lawful command of his ſuperior officer, is guilty of mutiny."

Mutiny-Act. See *Military-State.*

MUTIUS (Caius), ſurnamed *Codrus*, and afterwards *Scævola*, was one of the illuſtrious Roman family of the Mutians, and rendered his name famous in the war between Porſenna king of Tuſcany and the Romans. That prince reſolving to reſtore the family of Tarquin the Proud, went to beſiege Rome 507 B. C. Mutius reſolved to ſacrifice himſelf for the ſafety of his country; and boldly entering the enemy's camp, killed Porſenna's ſecretary, whom he took for Porſenna himſelf. Being ſeized and brought before Porſenna, he told him boldly, that 300 young men like himſelf had ſworn to murder him; *but ſince this hand has miſſed thee*, continued he, *it muſt be puniſhed;* then putting his right hand on the burning coals, he let it burn with ſuch a conſtancy as aſtoniſhed the beholders. The king, amazed at the intrepidity of this young Roman, ordered that he ſhould have his freedom and return to Rome, and ſoon after concluded a peace with the Romans. From this action Mutius obtained the ſurname of *Scævola*, "or left-handed," which was enjoyed by his family.

Mutius Scævola (Q.), ſurnamed the *Augur*, was an excellent civilian, and inſtructed Cicero in the laws. He was made prætor in Aſia; was afterwards conſul, and performed very important ſervices for the republic.

He ought not to be confounded with *Quintus Mutius Scævola*, another excellent civilian, who was prætor in Aſia, tribune of the people, and at length conſul, 95 B. C. He governed Aſia with ſuch prudence and equity, that his example was propoſed to the governors who were ſent into the provinces. Cicero ſays, "that he was the moſt eloquent orator of all the civilians, and the moſt able civilian of all the orators." He was aſſaſſinated in the temple of Veſta, during the wars of Marius and Sylla, 82 B. C.

MUTTON, the common name of the fleſh of a ſheep after the animal has been killed. Mutton has been commonly preferred to all the fleſhes of quadrupeds. And indeed, beſides its being more perfect, it has the advantage over them of being more generally ſuited to different climates; whereas beef, *e. g.* requires a very nice intermediate ſtate, which it ſeems to enjoy in temperate climates; for although northern countries ſupply what are reckoned the beſt cattle, it is in the rich ſouthern paſtures that they are brought to perfection. Now the ſheep can be brought almoſt to the ſame perfection in the bleak northern regions as in the ſouthern countries.

MUTUAL, a relative term, denoting ſomething that is reciprocal between two or more perſons.

Thus we ſay, *mutual aſſiſtance*, *mutual averſion*, &c. There are mutual or reciprocal duties, offices, &c. between ſuperiors and inferiors; as the State and its Citizens the maſter and his ſervants, &c.

Vaugelas makes a diſtinction between *mutual* and *reciprocal: mutual*, according to him, is underſtood of what is between two only; and *reciprocal*, of what is between more than two: but this diſtinction is little regarded in common uſe.

MUTULE, in architecture, a kind of ſquare modillion ſet under the cornice of the Doric order.

MUTUNUS, or Mutinus (fab. hiſt.), a deity among the Romans, much the ſame as the Priapus of the Greeks. The Roman matrons, and particularly newly married women, diſgraced themſelves by the obſcene ceremonies which cuſtom obliged them to obſerve before the ſtatue of this impure deity.

MUZZLE *of a* Gun *or* Mortar, the extremity at which the powder and ball is put in; and hence the muzzle-ring is the metalline circle or moulding that ſurrounds the mouth of the piece.

MYA, the gaper, in zoology; a genus belonging to the order of vermes teſtacea, the characters of which are theſe. It has a bivalve ſhell gaping at one end; the hinge, for the moſt part, furniſhed with a thick, ſtrong, and broad tooth, not inſerted into the oppoſite valve. Its animal is an Ascidia. The moſt remarkable ſpecies are.

Plate CCCXXXV. fig. 1.

1. The declivis, or ſloping mya, has a brittle half-tranſparent ſhell, with a hinge ſlightly prominent near the open, and ſloping downwards. It inhabits the rivers of Europe. It is frequent about the Hebrides; the fiſh eaten there by the gentry.

Fig. 2.

2. The mya pictorum has an oval brittle ſhell, with a ſingle longitudinal tooth like a lamina in one ſhell, and two in the other; the breadth is a little above two inches, the length one. It inhabits rivers. The ſhells are uſed to put water-colours in, whence the name. Otters feed on this and the other freſh-water ſhells.

Fig. 3. & 4.

3. The margaritifera, or pearl mya, has a very thick, coarſe, opaque ſhell; often much decorticated; oblong, bending inward on one ſide, or arcuated; black on the outſide; uſual breadth from five to ſix inches, length two and a quarter. It inhabits great rivers, eſpecially thoſe which water the mountainous parts of Great Britain.—This ſhell is noted for producing quantities of pearl. There have been regular fiſheries for the ſake of this precious article in ſeveral Engliſh rivers. Sixteen have been found within one ſhell. They are the diſeaſe of the fiſh, analogous to the ſtone in the human body. On being ſqueezed, they will eject the pearl, and often caſt it ſpontaneouſly in the ſand of the ſtream. The river Conway was noted for them in the days of Cambden. A notion alſo prevails, that Sir Richard Wynne of Gwydir chamberlain to Catharine

rine queen to Charles II. preſented her majeſty with a pearl (taken in this river) which is to this day honoured with a place in the regal crown. They are called by the Welch *cregen diluw*, or "deluge ſhells," as if left there by the flood. The Irt in Cumberland was alſo productive of them. The famous circumnavigator, Sir John Hawkins, had a patent for fiſhing in that river. He had obſerved pearls plentiful in the Straits of Magellan, and flattered himſelf with being enriched by procuring them within his own iſland. In the laſt century, ſeveral of great ſize were got in the rivers of the counties of Tyrone and Donegal in Ireland. One that weighed 36 carets was valued at 40 l. but being foul, loſt much of its worth. Other ſingle pearls were ſold for 4 l. 10 s. and even for 10 l. The laſt was ſold a ſecond time to Lady Glenlealy, who put it into a necklace, and refuſed 80 l. for it from the ducheſs of Ormond. Suetonius reports, that Cæſar was induced to undertake his Britiſh expedition for the ſake of their pearls; and that they were ſo large that it was neceſſary to uſe the hand to try the weight of a ſingle one. Mr Pennant ſuppoſes that Cæſar only heard this by report; and that the cryſtalline balls called *mineral pearl*, were miſtaken for them. We believe that Cæſar was diſappointed of his hope: yet we are told that he brought home a buckler made with Britiſh pearl, which he dedicated to, and hung up in, the temple of Venus Genetrix: a proper offering to the goddeſs of beauty, who ſprung from the ſea. It may not be improper to mention, that notwithſtanding the claſſics honour Engliſh pearl with their notice, yet they report them to have been ſmall and ill-coloured, an imputation that in general they are ſtill liable to. Pliny ſays, that a red ſmall kind was found about the Thracian Boſphorus, in a ſhell called *mya;* but does not give it any mark to aſcertain the ſpecies.

Linnæus made a remarkable diſcovery relating to the generation of pearls in this fiſh.---It is a fiſh that will bear removal remarkably well; and it is ſaid, that in ſome places they form reſervoirs for the purpoſe of keeping it, and taking out the pearl, which, in a certain period of time, will be again renewed. From obſervations on the growth of their ſhells, and the number of their annular laminæ or ſcales, it is ſuppoſed the fiſh will attain a very great age; 50 or 60 years are imagined to be a moderate computation. The diſcovery turned on a method which Linnæus found, of putting theſe ſhell-fiſh into a ſtate of producing pearls at his pleaſure; though the final effect did not take place for ſeveral years: He ſays, that in five or ſix years after the operation, the pearl would have acquired the ſize of a vetch. We are unacquainted with the means by which he accompliſhed this extraordinary operation; but it was probably publiſhed at the time, and conſidered as important, ſince it is certain that the author was rewarded with a munificent premium from the ſtates of the kingdom on this account. We regret that we cannot ſpeak more fully on this head; but may obſerve, that it is probable, from a paper publiſhed many years afterwards in the Berlin Acts, that the method conſiſted in injuring the ſhell externally, perhaps by a perforation; as it has been obſerved, that theſe concretions in ſhell-fiſh are found on the inſide, exactly oppoſite to perforations and injuries made from without by ſerpulæ and other animals.

MYAGRUM, Gold of Pleasure, in botany: A genus of the ſiliculoſa order, belonging to the tetradynamia claſs of plants; and in the natural method ranking under the 39th order, *Siliquoſæ*. The ſilicula is terminated by an oblong ſtyle; the cell generally monoſpermous. There are five ſpecies; but the only remarkable one is the ſativum, which grows naturally in corn-fields in the ſouth of France and Italy, and alſo in ſome parts of Britain. It is an annual plant, with an upright ſtalk, a foot and a half high, ſending out two or four ſide-branches, which grow erect; the flowers grow in looſe ſpikes at the end of the branches, ſtanding upon ſhort footſtalks an inch long; they are compoſed of four ſmall yellowiſh petals, placed in form of a croſs; theſe are ſucceeded by oval capſules, which are bordered and crowned at the top with the ſtyle of the flower, having two cells filled with red ſeeds.--- This is cultivated in Germany for the ſake of the expreſſed oil of the ſeeds, which the inhabitants uſe for medicinal, culinary, and œconomical purpoſes. The ſeeds are a favourite food with geeſe. Horſes, goats, ſheep, and cows, eat the plant.

MYCALE, a city and mountain of Caria; alſo a promontory of Aſia oppoſite Samos, celebrated for a battle which was fought there between the Greeks and Perſians about the year of Rome 275. The Perſians were about 100,000 men, who had juſt returned from the unſucceſsful expedition of Xerxes in Greece.— They had drawn their ſhips to the ſhore, and fortified themſelves ſtrongly, as if determined to ſupport a ſiege. They ſuffered the Greeks to diſembark from their fleet without the leaſt moleſtation, and were ſoon obliged to give way before the cool and reſolute intrepidity of an inferior number of men. The Greeks obtained a complete victory, ſlaughtered ſome thouſands of the enemy, burned their camp, and ſailed back to Samos with an immenſe booty, in which were 70 cheſts of money.

MYCENÆ (anc. geog.) a town of Argolus, in Peloponneſus. The kingdom of the Argives was divided into two portions by Acriſius and his brother Prœtus. Argos and Mycenæ were their capitals.--- Theſe, as belonging to the ſame family, and diſtant only about 50 ſtadia or ſix miles and a quarter from each other, had one tutelary deity, Juno, and were jointly proprietors of her temple, the Heræum, which was near Mycenæ. It was here that Agamemnon reigned. He enlarged his dominions by his valour and good fortune, and poſſeſſed, beſides Mycenæ, the region about Corinth and Sicyon, and that called afterwards Achæa. On his return from Troy, he was ſlain with his companions at a banquet. Mycenæ then declined; and under the Heraclidæ was made ſubject to Argos. (See Argos and Argeia.) The Mycenæans ſending 80 men, partook with the Lacedæmonians in the glory acquired at Thermopylæ. The jealouſy of the Argives produced the deſtruction of their city, which was abandoned after a ſiege, and laid waſte in the firſt year of the 78th Olympiad, or 466 years before Chriſt. Some part of the wall remained in the ſecond century, with a gate, on which were lions, a fountain, the ſubterraneous edifices where Atreus and his ſons had depoſited their treaſures, and, among other ſepulchral monuments, one of Agamemnon, and one of his fellow-ſoldiers and ſufferers.

MYCETITES Discoides, in natural hiſtory, a

name

Mycone ‖ Mycteria.

name given by Dr Woodward to thoſe kinds of foſſile coralloide bodies which the generality of writers had called, after Dr Plott, *porpitæ*. Theſe are uſually ſmall, and of a roundiſh, but flatted figure; they are hollowed on one ſide with a ſort of umbilicus, and ſtriated on the other, they are found on the ploughed lands in Oxfordſhire, and ſome other of the midland counties, and in other places, buried in the ſolid ſtrata of ſtone; they are ſometimes yellowiſh, ſometimes browniſh, and are from the breath of an inch to a fourth part or leſs of that ſize; when broken, they are uſually found to conſiſt of a kind of ſpar, not unlike that of which the ſhelly coats of the echinitæ, or the lapides indici, and other ſpines of echini conſiſt in their foſſile ſtate; and in ſome of them the ridges and ſtriæ are thick ſet with little knobs and tubercles. The baſis in ſome of theſe is flat, as it is in others riſing in form of a circular elevation from the umbilicus, and others have a circular cavity in the ſame place.

MYCONE, an iſland on the Archipelago, ſituated in E. Long. 25. 51. N. Lat. 37. 28. It is about 36 miles in circuit, and has a town of the ſame name, containing about 3000 inhabtants. The people of this iſland are ſaid to be the beſt ſailors in the Archipelago, and have about 150 veſſels of different ſizes. The iſland yields a ſufficient quantity of barley for the inhabitants, and produces abundance of figs, and ſome olives; but there is a ſcarcity of water, eſpecially in ſummer, there being but one well on the iſland.—There are a great number of churches and chapels, with ſome monaſteries. The dreſs of the women in this iſland is very remarkable, and as different from that of the other iſlands as that of thoſe iſlanders is different from the dreſs of the other European ladies. Their heads are adorned with lively coloured turbans; their garments are a ſhort white ſhift plaited before and behind, which reaches to their knees; they have white linen-drawers; and red, green, yellow, or blue ſtockings, with various coloured ſlippers. An ordinary ſuit for the better ſort will coſt 200 crowns.

MYCONUS (anc. geog.) one of the iſlands called Cyclades, near Delos, under which the laſt of the Centaurs ſlain by Hercules are feigned to lie buried. Hence the proverb, *Omnia ſub unam Myconum congerere*, applied to an injudicious or unnatural farrago. Myconii, people noted for baldneſs. Hence Myconius, a bald perſon. According to Strabo, the inhabitants became bald at the age of 20 or 25; and Pliny ſays that the children were always born without hair. The iſland was poor, and the inhabitants very avaricious; whence Archilochus reproached a certain Pericles, that he came to a feaſt like a Myconian, that is, without previous invitation. Now called *Mycone*, an iſland in the Archipelago. E. Long. 25° 6′. Lat. 37°.

Plate cccxxxv.

MYCTERIA, the Jabiru, in ornithology; a genus of birds belonging to the order of grallæ. The bill is long, bending upwards, and acute; the noſtrils are ſmall and linear; there is no tongue; and the feet have four toes. There are two ſpecies: 1. The Americana, or American jabiru, is about the ſize of a turky. The bill is long, ſtout, and of a black colour; the whole plumage is white, except the head, and about two thirds of the neck, which are bare of feathers and of a blackiſh colour; the remainder is alſo bare, and of a fine red; on the hind-head are a few greyiſh feathers; the legs are ſtrong, of a great length, and covered with black ſcales; wings and tail even at the end. This bird is found in all the Savannas of Cayenne, Guiana, and other parts of South America. It is migratory and gregarious. It makes its neſt in great trees, which grow on the borders; lays two eggs, and brings up the young in the neſt till they can deſcend to the ground. The colour of the young birds is grey: the ſecond year it changes to roſe colour, and the third to pure white. They are very wild and voracious, and their food is fiſh, which they devour in great quantities. The fleſh of the young birds is ſaid to be good eating, but that of the old is hard and oily.

Mycteria ‖ Myiagrus.

2. The Aſiatica, or Indian jabiru, is of a large ſize. The bill is duſky, almoſt ſtraight above, and gibbous near the fore head; the under mandible ſwelled beneath; and from the baſe of the bill there paſſes through and beyond the eye a black ſtreak. The general colour of the plumage is white; the lower half of the back, the prime quills, and the tail, are black; the legs a pale red. This ſpecies inhabits the Eaſt Indies, and feeds on ſnails.

MYGDONIA (anc. geog.), a diſtrict of Macedonia, to the north of the Sinus Thermaicus, and eaſt of the river Axius, which ſeparates it from Bottiæis, and weſt of the river Strymon, (Pliny.) Alſo a diſtrict of Meſopotamia, which took its name from that of Macedonia, running along the Euphrates, from Zeugma down to Thapſacus, extending a great way eaſt, becauſe Niſibis was reckoned to it.

MYGINDA, in botany: A genus of the tetragynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The calyx is quadripartite; the petals four; the fruit a globoſe plum.

MYIAGRUS deus, in the heathen mythology, a name given ſometimes to Jupiter, and ſometimes to Hercules, on occaſion of their being ſacrificed to for the driving away the vaſt numbers of flies which infeſted the ſacrifices on certain public occaſions. The word is uſually ſpelt *Myagrus;* but this muſt be an error, as this word does not expreſs the *fly-deſtroyer*, but the *mouſe-deſtroyer:* and we have it ſufficiently teſtified by the ancients, that flies were the only creatures againſt whom this deity was invoked. Pliny calls this deity alſo *Myoides*, and tells us that the flies which uſed to peſter the Olympic rites went away in whole clouds on the ſacrificing a bull to this god. We find in Athenæus alſo, that this ſacrificing to the god of flies at the Olympic games was a conſtant cuſtom. Some diſtinguiſh theſe two deities, and tell us that the latter, or Myoides, uſed to viſit the nations in vengeance, with a vaſt multitude of flies; and that, on paying him the due honours of a ſacrifice, they all went away again; and this ſeems to agree with what Pliny tells us in ſome places.

At the time of the Olympic games, Jupiter was worſhipped under the name of the *Apomyos* or *Myiagrus Deus*, to ſupplicate the deſtruction of thoſe troubleſome creatures. This happened only once in many years, when the ſacrifices were performed there; but the Elians worſhipped him continually under this name, to deprecate the vengeance of heaven, which uſually ſent, as they expreſſed it, an army of flies and other inſects, toward the latter end of the ſummer, that infeſted the whole country with ſickneſs and peſtilence.

MYOIDES [illegible], in the heathen mythology, a name ſometimes given to Hercules, but more frequently to Jupiter, to whom a bull was ſacrificed, in order to make him propitious in driving away the flies that infeſted the Olympic games.

MALAE (anc. geog.) a Greek city ſituated on an iſthmus of a cognominal peninſula, on the north eaſt ſide of the iſland. *Mylaei*, or *Mylenſes*, the people. A town built by thoſe of Zancle (Strabo,) Mylaeus, the epithet, as Mylæus Campus mentioned by Polybius. Now called *Milazzo* a port town of Sicily, in the Val di Demona. E. Long. 15° 5′. Lat. 38. 36′.

MULASY, or Mylassa, (anc. geog.), a noble city of Caria in Aſia Minor, ſituated at the diſtance of about three leagues from the *Sinus Ceramicus*. It was the capital of Hecatomnus king of Caria, and father of Mauſolus. Pliny ſpeaks of Menander king of Caria, and ſays that the Rhodians preſerved with the greateſt care his portrait painted by Appelles: but it was not in honour of this Menander that a Corinthian pillar was erected at Mylaſa, which ſtill exiſts, and on which is to be ſeen the following inſcription: "The people erected this pillar in honour of Menander, the ſon of Uliades, and grandſon of Euthydemus, the benefactor of his country, and whoſe anceſtors rendered it great ſervices alſo." Euthydemus, the grandfather of this Menander, lived in the time of Julius Cæſar and Auguſtus. Caria was taken by Mithridates, and afterwards by Labienus, whoſe father had been one of Cæſar's generals. Hybrias, whoſe eloquence and valour deſervedly intitled him to a diſtinguiſhed rank among his countrymen, in vain encouraged them to make a moſt obſtinate defence while it was beſieged by the latter. He himſelf was obliged to yield to neceſſity, and to take refuge at Rhodes: but ſcarely had the conqueror quitted the city, when Hybrias returned and reſtored liberty to his country.—Not content with rendering it this ſervice, he alſo deſtroyed the power of a dangerous citizen, whoſe riches and talents rendered him a neceſſary evil. Euthydemus, often baniſhed, and as often recalled, always too powerful in a ſtate the independence of which he threatened, ſaw his ambition checked by the zeal and activity of Hybrias. The Romans left to Mylaſa that liberty of which it rendered itſelf ſo worthy, by the great efforts it made to preſerve it. Pliny calls it *Mylaſa libera*. Strabo informs us, that it was one of the moſt magnificent cities of antiquity, and one of thoſe the temples, porticoes, and other public monuments of which were highly admired. A quarry of white marble in the neighbourhood furniſhed it with abundance of materials for erecting theſe edifices.—The Mylaſians had two temples dedicated to Jupiter, one ſituated in the city, which was named *Oſogo*, and another built on a mountain, at the diſtance of 60 leagues. The latter was dedicated to *Jupiter Stratius*, Jupiter the Warrior. His ſtatue, which was very ancient, inſpired great veneration; people came from all quarters to implore his protection; and for the greater accommodation of his votaries a paved way was conſtructed, which reached from Mylaſa to this venerable fabric. This city is now called *Melaſſo*, and, according to Dr Chandler, is ſtill a large place.—The houſes are numerous, but chiefly of plaſter, and mean, with trees interſperſed. The air is accounted bad; and ſcorpions abound as anciently, entering often at the doors and windows, and lurking in the rooms. The plain is ſurrounded by lofty mountains, and cultivated. Round the town are ranges of broken columns, the remnants of porticoes, now with rubbiſh bounding the vineyards. A large portion of the plain is covered with ſcattered fragments, and with piers of ordinary aqueducts; beſides inſcriptions, moſtly ruined and illegible. Some altars dedicated to Hecatomnus have been diſcovered. Of all the ancient temples which formerly ornamented this city, one only eſcaped the power of time, the blind zeal of the early Chriſtians, and the barbarous ſuperſtition of the Mahometans. This monument was dedicated to Auguſtus and the divinity of Rome. When Pococke viſited Melaſſo, it was perfect and entire; but at preſent no traces of it remain, except a few fragments, which have been employed to conſtruct a Turkiſh moſque.

MYLOGLOSSUM, in anatomy. See Anatomy, *Table of the Muſcles*.

MYLOHYOIDÆUS. *Ibid.*

MYNSICHT (Hadrian), phyſician to the duke of Mecklenburgh and ſeveral other German princes, was diſtinguiſhed for his knowledge of chemiſtry, at the beginning of the 17th century. He publiſhed a work entitled *Armentarium Medico-Chymicum*, which has undergone various editions. In this work he gives a deſcription of ſeveral medicines, about the virtues of which he is not always to be depended upon. To him we are indebted for a knowledge of the ſalt *de duobus* or the *Arcanum*, which is ſtill in uſe.

MYOLOGY, formed of μυς, μυος, "a muſcle," and λογος, "diſcourſe"), in anatomy, a deſcription of the muſcles; or the knowledge of what relates to the muſcles of the human body. See Anatomy, *Table of the Muſcles*.

MYOMANCY, a kind of divination, or method of foretelling future events by means of mice.

Some authors hold myomancy to be one of the moſt ancient kinds of divination; and think it is on this account that Iſai. lxvi. 17. reckons mice among the abominable things of the idolators. But, beſide that it is not certain that the Hebrew word עכבר uſed by the prophet ſignifies *a mouſe*, it is evident it is not the divination by that animal, be it what it will, that is ſpoken of, but the eating it.

MYOPIA, Short-sightedness: a ſpecies of viſion wherein objects are ſeen only at ſmall diſtances. See Medicine, nº 361.

MYOSOTIS, Scorpion-grass: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The corolla is ſalver-ſhaped, quinquefid, and emarginated; the throat ſhut up by ſmall arches. There are four ſpecies; of which the moſt remarkable is the ſcorpioides, or mouſe ear. This is a native of Britain, growing naturally in dry fields, and on the margins of ſprings and rills. It hath naked ſeeds, and the points of the leaves callous. It varies conſiderably in different ſituations. In dry places the plant and flowers are ſmaller; in moiſt ones both are larger, and ſometimes hairy. The bloſſoms vary from a full blue to a very pale one, and ſometimes a yellow; and appear in a long ſpirally twiſted ſpike. When it grows in the water, and its taſte and ſmell is thereby rendered leſs obſervable, ſheep will ſometimes eat it, but it is generally fatal to them. Cows, horſes, ſwine, and goats refuſe it.

MYOSURUS, in botany: A genus of the polygynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 26th order *Multiſiliquæ*, The calyx is pentaphyllous, the leaves cohering at the baſe; there are five ſubulated nectaria reſembling petals: the ſeeds are numerous.

Plate CCCXVIII fig 12. MYOXUS, the DORMOUSE, in zoology; a genus of quadrupeds belonging to the order of glires. There are two fore-teeth in each jaw; the upper ones cuneated, the under compreſſed; the whiſkers are long, the tail is hairy and round, growing thicker towards the extremity; the fore and hind legs are of equal length, and the fore-feet have four toes.

1. The glis, or hoary dormouſe, is of a pale aſh-colour on the upper parts of the body, and whitiſh on the under; and is about the ſize of the common ſquirrel, but thicker in the body. It inhabits France and the ſouth of Europe, and the ſouth-weſt of Ruſſia about the Volga of Samara. This animal, which is the ελειος of Ariſtotle, μυοξος of Oppian, and *glis* of, Pliny, was held in great eſteem among the Romans as a luxurious delicacy: they were, fed in places called *gliriaria*, conſtructed for the purpoſe, and they are ſtill eaten by the modern Italians. It forms a neſt in the hollow of ſome tree, in which it ſleeps all day; feeds in the night on nuts, walnuts, the ſeeds of apples, &c. and grows very fat in autumn. About the month of October, they gather in troops; and retiring into ſubterranean burrows, remain torpid till near the end of May, The female has ten teats, ſix of which are ſituated on the breaſt, and four on the belly: and ſhe brings from nine to twelve young ones at a litter,

Fig. 14. 2. The nitella, or garden dormouſe, is of a tawny colour on the upper parts of the body, and whitiſh aſh tinged with yellow on the under; has a black circle round each eye, and a black ſpot behind each ear; and is five inches long, beſides the tail, which meaſures four. It inhabits the ſouth parts of Europe and Ruſſia, where it lives chiefly in gardens, though it ſometimes is found in houſes. They are very deſtructive to fruit, particularly peaches, which they ſeem to prefer to every other kind. They alſo eat peaſe, apricots, and plums; and when ſoft fruits are not to be had, they will eat almonds, filberts, nuts, and even leguminous plants. Of theſe they carry off great quantities into their retreats which they dig in the earth, and particularly in well cultivated gardens; for in old orchards they are often found in hollow trees, where they make beds of herbs, moſs, and leaves. Eight or ten of them are frequently found in the ſame place, all benumbed, and rolled up in the midſt of their proviſion of fruits and nuts. They copulate in ſpring, and bring forth in ſummer, The litter conſiſts of five or ſix young, who grow very quickly, but are not fertile till the next year. Their fleſh is not eatable but has the ſame diſagreeable odour with the domeſtic rat.

Fig. 3. 3. The muſcardinus, or common dormouſe, is about the ſize of the domeſtic mouſe, but of a plumper appearance; the noſe is more blunt; the head, ſides, belly, and tail, are of a tawny red colour, the throat white. Dormice inhabit woods, or very thick hedges; forming their neſts in the hollow of ſome low tree, or near the bottom of a cloſe ſhrub; they form little magazines of nuts, and eat in an upright poſture like the ſquirrel. The conſumption of their hoard, however, during the rigour of the ſeaſon is but ſmall; for they ſleep moſt of the time, retiring into their holes; at the approach of winter they roll themſelves up, and become torpid. Sometimes they experience a ſhort revival in a warm ſunny day, when they take a little food, and relapſe into their former ſtate. Theſe animals ſeldom appear far from their retreats, or in any open place; for which reaſon they ſeem leſs common in Britain than they really are. They make their neſts of moſs, graſs, and dead leaves; and bring uſually three or four young at a time.

MYREPSUS (Nicolas), was a phyſician of Alexandria, to whom we are under great obligations for the pains he took to collect, into a kind of pharmacopœia, all the compound medicines which lie ſcattered in the works of the Greeks and Arabian writers. His work was accompliſhed before the beginning of the 14th century; and though written in barbarous Greek, continued for a long time to be the rule of pharmaceutical preparations in Europe. A tranſlation of it into Latin by Leonard Fuſch is entitled *Opus Medicamentorum, in Sectiones quadriginta octo digeſtum.* There are a great many editions of this work; the beſt is that of Hartman Beverus; Nuremberg, 1658, 8vo.

MYRIAD, a term ſometimes uſed to denote ten thouſand.

MYRICA, GALE, or SWEAT-WILLOW, in botany: A genus of the tetrandria order, belonging to the diœcia claſs of plants; and in the natural method ranking under the fifth order, *Amentaceæ*. The ſcale of the male catkin is in the form of a creſcent, without any corolla. The ſcale of the female catkin the ſame: there is no corolla; but two ſtyles, and a monoſpermous berry.

1. The gale, Dutch myrtle, or ſweet-willow, grows naturally upon bogs in many places both of Scotland and England. It riſes about four feet high, with many ſhrubby ſtalks, which divide into ſeveral ſlender branches, garniſhed with ſtiff ſpear-ſhaped leaves of a light yellowiſh green, ſmooth and a little ſawed at their points. The female flowers or catkins are produced from the ſides of the branches, growing upon ſeparate plants from the female, which are ſucceeded by cluſters of ſmall berries, each having a ſingle ſeed. It flowers in July, and ripens in autumn. When tranſplanted into ſhruberries, the moiſteſt parts muſt be aſſigned to it.

The leaves, flowers, and ſeeds of this plant, have a ſtrong fragrant ſmell, and a bitter taſte. They are ſaid to be uſed among the common people for deſtroying moths and cutaneous inſects, being accounted an enemy to inſects of every kind; internally, in infuſions, as a ſtomachic and vermifuge; and as a ſubſtitute to hops for preſerving malt liquors, which they render more inebriating, and of conſequence leſs ſalubrious: it is ſaid that this quality is deſtroyed by boiling.

2. The cerifera, wax-bearing myrica, or candleberry myrtle, is a native of North America. It is a ſmall tree about ten or twelve feet high, with crooked ſtems branching forth near the ground irregularly. The leaves grow irregularly on them all round; ſometimes by pairs, ſometimes alternately but generally at unequal diſtances. They are of a lanceolated figure: and ſome are ſerrated at the top, whilſt others have their edges wholly entire. They ſtand on very ſhort footſtalks; having their upper ſurface ſmooth, and of a ſhining green colour, whilſt their under is of a more duſky hue. The branches of the old plants ſhed their leaves in the autumn; but the young plants raiſed from ſeeds retain them the greateſt part of the winter ſo as during that ſeaſon to have the appearance of an evergreen. But this beauty will not be laſting, for they ſhed their leaves proportionally earlier as the plants get older. There are both male and female trees of this ſort; The flowers are ſmall, of a whitiſh colour, and make no figure; neither does the fruit that ſucceeds the female, which is a ſmall, dry, blue berry, though produced in cluſters, make any ſhow. So that it is from the leaves this trees receives its beauty and value; for theſe being bruiſed, as well as the bark of the young ſhoots emit the moſt refreſhing and delightful fragrance, that is exceeded by no myrtle, or any other aromatic ſhrub.

There is a variety of this ſpecies of lower growth, with ſhorter but broader leaves, and of equal fragrance. This grows commonly in Carolina; where the inhabitants collect from its berries a wax of which they make candles, and which occaſions its being called the *candleberry tree*. It delights in a moiſtiſh ſoil. —The wax is procured in the followed manner: In November and December, when the berries are ripe, a man with his family will remove from home to ſome iſland or ſand-bank near the ſea, where theſe trees moſt abound, taking with them kettles to boil the berries in. He builds a hut with palmetto leaves for the ſhelter of himſelf and family during his reſidence there which is commonly four or five weeks. The man cuts down the trees, while the children ſtrip off the berries into a porridge-pot; and having put water to them, they boil them till the oil floats, which is then ſkimmed off into another veſſel. This is repeated till no more oil appears. When cold, this hardens to the conſiſtence of wax, and is of a dirty green colour. Then they boil it again, and clarify it in braſs kettles; which gives it a tranſparent greenneſs. Theſe candles burn a long time, and yield a grateful ſmell. They uſually add a fourth part of tallow, which makes them burn clearer. Both the above ſorts may be propagated by ſeeds or layers. 1. The ſeeds of the candleberry myrtle received from abroad: thoſe of the ſweet-gale from the bogs. where they grow in England or Scotland. The beſt way is to ſow them in boxes of earth from a rich paſture, well broken and fine. They ſhould be ſown about half an inch deep: and when the hot weather comes on, ſhould be ſet in the ſhade, They will often remain the ſecond year before they come up, eſpecially thoſe ſeeds that come from abroad. If the boxes are ſet in the ſhade, and the plants come up, they will require no other trouble the firſt ſummer than keeping clean from weeds; in winter they ſhould be removed to a warm edge or wall, where they may enjoy the benefit of the ſun. In the following ſpring they will come up in plenty, In the beginning of May they ſhould reſume their ſhady ſituation; and this ſummer they will require no other trouble than weeding and watering in dry weather. In the winter they ſhould be removed into a well-ſheltered place; and this may be repeated two years; when in the ſpring they ſhould be taken out of the boxes, and planted in the nurſery at about a foot aſunder. 2. Theſe ſorts may be alſo eaſily propagated by layers; for this operation being performed on the young wood in the autumn, will occaſion them to ſhoot good roots by the autumn following; many of which will be good plants, fit for any place. 3. Theſe plants may likewiſe be increaſed by ſuckers, for many of them often throw them out in vaſt plenty: ſo that theſe being taken out, the ſtrongeſt and beſt rooted may be finally ſet out; whilſt the weaker, and thoſe with leſs root, may be planted in the nurſery.

There are five other ſpecies, *viz*, the *nagi*, or Japan myrica, with lanceolate entire veinleſs leaves, and berries about the ſize of a cherry: the *ethiopica*, or willow-leaved myrica, with the leaves ſlightly ſerrated; a native of Ethiopia; the *quercifolia*, with oblong leaves, ſinuated or notched on the ſides, like the leaves of the oak; of which there are two varieties, the ſmooth and the hairy, natives of the Cape of Good Hope: the trifoliata, or trifoliate myrica, with ternate leaves toothed on the edges; and the cordifolia, or heart-leaved myrica, with [illegible] crenated, ſawed, ſeſſile leaves; both are natives of the Cape. Theſe are all tender plants, kept as curioſities in the green-houſe, and difficult of propagation.

MYRIOPHILLUM, in botany: A genus of the polyandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 15th order, *Inundatæ*. The male calyx is tetraphyllous; there is no corolla; the ſtamina are eight in number. The female calyx is tetraphyllous; the piſtils four; there is no ſtyle; and four naked ſeeds.

MYRISTICA, the NUTMEG-TREE, in botany, A genus of plants belonging to the claſs diœcia, and order ſyngeneſia, in the *New Genera Plantarum* of Linnæus by *Shreler*; and of the natural order *Lauri*, in his fourth claſs *Monocotylidones*.—The male calyx is monophyllous, ſtrong, and parted into three *lacinii* of an oval ſhape, and ending in a point, it has no corolla. In the middle of the receptacle riſes a column of the height of the calyx: to the upper part of which the antheræ are attached. They vary in number from three to twelve or thirteen—The female calyx and corolla as in the male, on a diſtinct tree. The germen of an oval ſhape; the ſtyle ſhort, with a bifid ſtigma; the lacinii of which are oval and ſpreading—The fruit is of that ſort called *drupa*. It is fleſhy, roundiſh, ſometimes uniloculer, ſometimes bivalved, aud burſts when ripe at the ſide. The ſeed is enveloped with a fleſhy and fatty membraneous ſubſtance, which divides into filaments (this, in one of the ſpecies is the mace of the ſhops). The ſeed or nutmeg is round or oval ſhaped, unilocular, and contains a ſmall kernel. variegated on the ſurface by the fibres running in the form of a ſcrew.

Species. There are five ſpecies of this genus according to ſome authors; but ſeveral of theſe being only varieties, may be reduced to three, viz.

1. Myriſtica fatua, or wild nutmeg: this grows in Tobago, and riſes to the height of an apple-tree; has oblong, lanceolated, downy leaves, and hairy fruit:—the nutmeg of which is aromatic, but when given inwardly is narcotic, and occaſions drunkenneſs, delirium, and madneſs, for a time. See a figure in *Gaerner de Sem* and *Fruct.* T. 41. f. 3. 4.

2. The myriſtica, ſebiſera, (*Virola Sibiſera Aublet*, page 904. Tab. 345.) A tree frequent in Guiana, riſing to 40 or even to 60 feet high; on wounding the trunk of which, a thick, acrid, red juice runs out. Aublet ſays nothing of the nutmegs being aromatic; he only obſerves, that a yellow fat is obtained from them, which ſerves many œconomical and medical purpoſes, and that the natives make candles of it.

3. The myriſtica moſchata, or nutmeg, attains the height of 30 feet, producing numerous branches which riſe together in ſtories, and covered with bark, which of the trunk is a reddiſh brown, but that of the young branches is of a bright green colour: the leaves are nearly elliptical, pointed, undulated, obliquely nerved, on the upper ſide of a bright green, on the under whitiſh, and ſtand alternately upon footſtalks: the flowers are ſmall, and hang upon ſlender peduncles, proceeding from the axillæ of the leaves: they are both male and female upon ſeparate trees.

M. Schwartz, who has carefully examined this as well as the two firſt ſpecies, preſerved in ſpirits, places them amongſt the monodelphia.

The nutmeg has been ſuppoſed to be the *Comacum* of Theophraſtus; but there ſeems little foundation for this opinion; yet can it with more probability be thought to be the *Chryſobalanus* of Galen. Our firſt knowledge of it was evidently derived from the Arabians; by Avicenna it was called *jiuſiban*, or *jauſi bond*, which ſignifies nut of banda. Rumphius both figured and deſcribed this tree; but the figure given by him is ſo imperfect, and the deſcription ſo confuſed, that Linnæus, who gave it the generic name *myriſtica*, was unable to aſſign its proper characters.—Sonnerat's account of the *muſcadier* is ſtill more erroneous; and the younger Linnæus was unfortunately miſled by this author, placing the myriſtica in the claſs *Polyandria*, and deſcribing the corolla as conſiſting of five petals. Thunberg who examined the flower of the nutmeg, places it in the claſs *Monœcia;* and according to this deſcription, the male flower has but one filament, ſurrounded at the upper part by the antheræ; and as the filaments are ſhort and ſlender, and the antheræ united, this miſtake might eaſily ariſe. M. De La Marck informs us, that he received ſeveral branches of the Myriſtica, both in flower and fruit, from the Iſle of France, where a nutmeg-tree, which was introduced by Monſieur Poivre in 1770, is now very large, and continually producing flowers and fruit. From theſe branches, which were ſent from Monſ. Cere, director of the king's garden in that iſland, Monſ. De La Marck has been enabled to deſcribe and figure this and other ſpecies of the myriſtica with tolerable accuracy: and that we have profited by his labours, will appear from the annexed plate, of which the following is an explanation:

Plate CCCXXXIV. Fig. *a.* A ſprig with fructification. The drupa of the natural ſize, and burſting open. Fig. *b.* The full-grown fruit cut lengthways. Fig. *c.* Another ſection of the ſame. Fig. *d.* The nutmeg enveloped with its covering the mace. Fig. *e.* The fatty membrane or mace ſpread out. Fig. *f.* The nutmeg of its natural ſize. Fig. *g.* The ſame with its external tegument removed at one end. Fig. *h.* The ſame with its outer tegument entirely removed. Fig. *i.* A tranſverſe ſection of the nutmeg. Fig. 1. and 2. Sprigs of the *Myriſtica moſchata* in flower, with a leaf of the natural ſize, and a repreſentation of the calyx and column in the flower. Plate CCCXXXV.

The ſeeds or kernels called *nutmegs* are well known, as they have been long uſed both for culinary and medical purpoſes. Diſtilled with water, they yield a large quantity of eſſential oil, reſembling in flavour the ſpice itſelf; after the diſtillation, an inſipid ſebaceous matter is found ſwimming on the water; the decoction inſpiſſated, gives an extract of an unctuous, very lightly bitteriſh taſte, and with little or no aſtringency. Rectified ſpirit extracts the whole virtue of nutmegs by infuſion, and elevates very little of it in diſtillation; hence the ſpirituous extract poſſeſſes the flavour of the ſpice in an eminent degree.

Nutmegs, when heated, yield to the preſs a conſiderable quantity of limpid yellow oil, which on cooling concretes into a ſebaceous conſiſtence. In the ſhops we meet with three ſorts of unctuous ſubſtances, called *oil of mace*, though really expreſſed from the nutmeg. The beſt is brought from the Eaſt Indies in ſtone jars; this is of a thick conſiſtence, of the colour of mace, and has an agreeable fragrant ſmell; the ſecond ſort, which is paler coloured, and much inferior in quality, comes from Holland in ſolid maſſes, generally flat, and of a ſquare figure: the third, which is the worſt of all, and uſually called *common oil of mace*, is an artificial compoſition of ſevum, palm oil, and the like, flavoured with a little genuine oil of nutmeg.

Method of gathering and preparing Nutmeg. When the fruit is ripe, the natives aſcend the trees, and gather it by pulling the branches to them with long hooks. Some are employed in opening them immediately, and in taking off the green ſhell or firſt rhind, which is laid together in a heap in the woods, where in time it putrefies. As ſoon as the putrefaction has taken place, there ſpring up a kind of muſhrooms, called *boleti moſchatyni*, of a blackiſh colour, and much valued by the natives, who conſider them as delicate eating. When the nuts are ſtripped of their firſt rhind they are carried home, and the mace is carefully taken off with a ſmall knife. The mace, which is of a beautiful red, but afterwards aſſumes a darkiſh or reddiſh colour, is laid to dry in the ſun for the ſpace of a day, and is then removed to a place leſs expoſed to his rays, where it remains for eight days, that it may ſoften a little. They afterwards moiſten it with ſea-water, to prevent it from drying too much, or from loſing its oil. They are careful, however, not to employ too much water, leſt it ſhould become putrid, and be devoured by the worms. It is laſt of all put into ſmall bags, and ſqueezed very cloſe. Mace muſt not be confounded with *macer*. See the word Macer.

The nuts, which are ſtill covered with their ligneous ſhell, are for three days expoſed to the ſun, and afterwards dried before a fire till they emit a ſound when they are ſhaken; they then beat them with ſmall ſticks in order to remove their ſhell, which flies off in pieces. Theſe nuts are diſtributed into three parcels; the firſt of which contains the largeſt and moſt beautiful, which are deſtined to be brought to Europe; the ſecond contains ſuch as are reſerved for the uſe of the inhabitants; and the third contains the ſmalleſt, which are irregular or unripe. Theſe are burnt; and part of the reſt is employed for procuring oil by preſſure. A pound of them commonly gives three ounces of oil, which has the conſiſtence of tallow, and has entirely the taſte of nutmeg. Both the nut and mace, when diſtilled, afford an eſſential, tranſparent, and volatile oil, of an excellent flavour.

The nutmegs which have been thus ſelected would ſoon corrupt if they were not watered, or rather pickled, with lime-water made from calcined ſhell-fiſh, which they dilute with ſalt-water till it attain the conſiſtence of fluid pap. Into this mixture they plunge the nutmegs, contained in ſmall baſkets, two or three times, till they are completely covered over with the liquor. They are afterwards laid in a heap, where they heat, and loſe their ſuperfluous moiſture by evaporation. When they have ſweated ſufficiently, they are then properly prepared, and fit for a ſea-voyage.

In the iſland of Banda, the fruit of the nutmeg-tree is preſerved entire in the following manner: When it is almoſt ripe, but previous to its opening, it is boiled in water and pierced with a needle. They next lay it in water to ſoak for ten days, till it has loſt its ſour and ſharp taſte. They then boil it gently in a ſyrup of ſugar, to which, if they wiſh it to be hard, a little lime is added. This operation is repeated for eight days, and each time the ſyrup is renewed. The fruit when thus preſerved is put for the laſt time into a pretty thick ſyrup, and is kept in earthen pots cloſely ſhut.

Theſe nuts are likewiſe pickled with brine or with vinegar; and when they intend to eat them, they firſt ſteep them in freſh water, and afterwards boil them in ſyrup of ſugar, &c.

Uſes. Nutmegs preſerved entire are preſented as deſerts, and the inhabitants of India ſometimes eat them when they drink tea. Some of them uſe nothing but the pulp; others likewiſe chew the mace; but they generally throw away the kernel, which is really the nutmeg. Many who perform ſea-voyages to the north chew this fruit every morning.

The medicinal qualities of nutmeg are ſuppoſed to be aromatic, anodyne, ſtomachic, and reſtringent; and with a view to the laſt mentioned effects, it has been much uſed in diarrhœas and dyſenteries. To many people the aromatic flavour of nutmeg is very agreeable; they however ſhould be cautious not to uſe it in too large quantities, as it is apt to affect the head, and even to manifeſt an hypnotic power in ſuch a degree as to prove extremely dangerous. Bontius ſpeaks of this as a frequent occurrence in India; and Dr Cullen relates a remarkable inſtance of this ſoporific effect of the nutmeg, which fell under his own obſervation, and hence concludes, that in apoplectic and paralytic caſes this ſpice may be very improper. He obſerves, that a perſon by miſtake took two drachms or a little more of powdered nutmeg: he felt it warm in his ſtomach, without any uneaſineſs; but in about an hour after he had taken it he was ſeized with a drowſineſs, which gradually increaſed to a complete ſtupor and inſenſibility; and not long after he was found fallen from his chair, lying on the floor of his chamber in the ſtate mentioned. Being laid a-bed he fell aſleep; but waking a little from time to time, he was quite delirious; and he thus continued alternately ſleeping and delirious for ſeveral hours. By degrees, however, both theſe ſymptoms diminiſhed; ſo that in about ſix hours from the time of taking the nutmeg he was pretty well recovered from both. Although he ſtill complained of head-ach, and ſome drowſineſs, he ſlept naturally and quietly the following night, and next day was quite in his ordinary health.

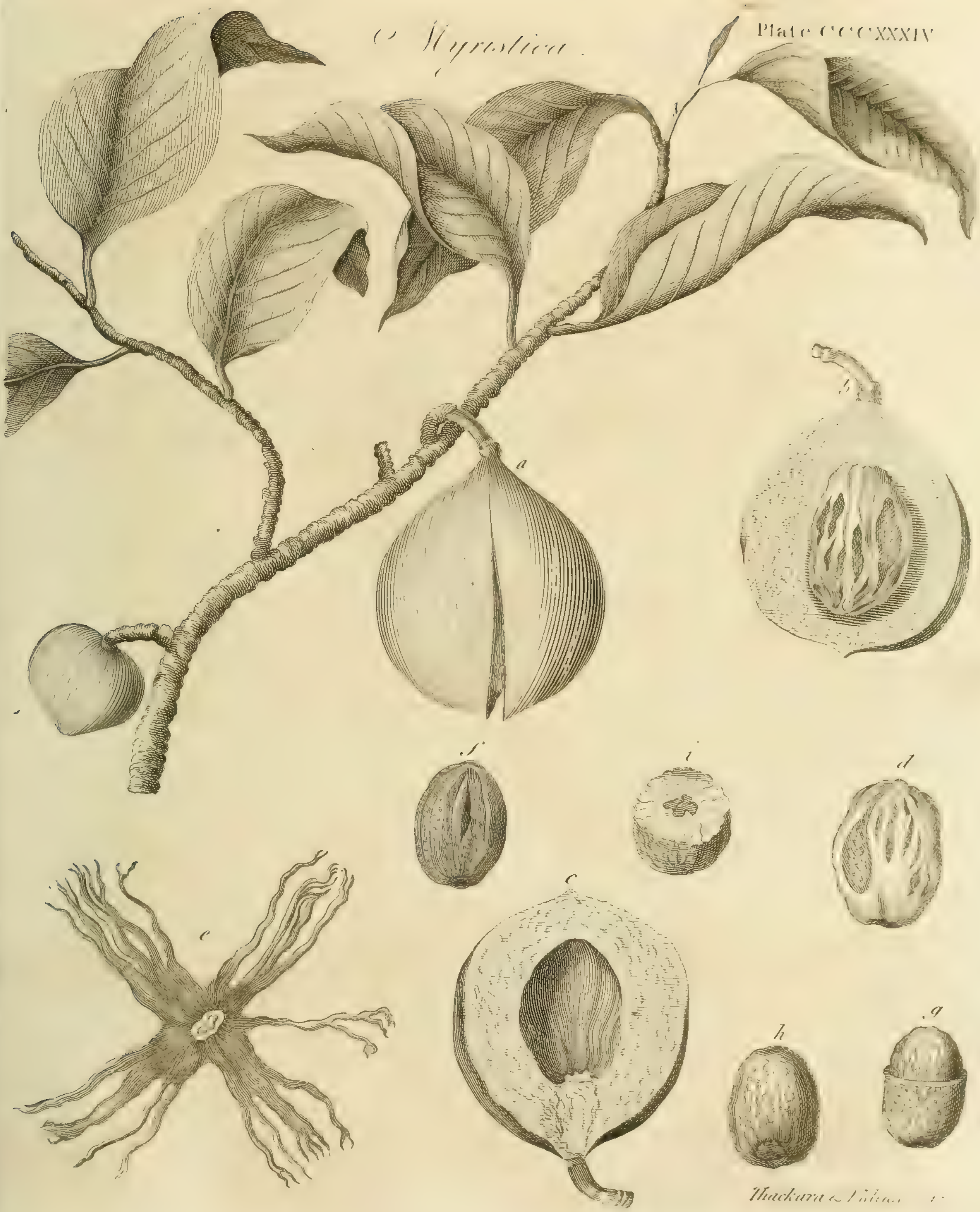
The officinal preparations of nutmeg are a ſpirit and eſſential oil, and the nutmeg in ſubſtance roaſted, to render it more aſtringent. Both the ſpice itſelf and its eſſential oil enter ſeveral compoſitions, as the confectio aromatica ſpiritus amonæ com. &c. Mace poſſeſſes qualities ſimilar to thoſe of the nutmeg, but is leſs aſtringent, and its oil is ſuppoſed to be more volatile and acrid.

Remarks on the Trade of Nutmegs. Nutmeg-trees grow in ſeveral iſlands in the eaſtern ocean. The wood-pigeon of the Moluccas is unintentionally a great planter of theſe trees, and diſſeminates them in places where a nation, powerful by its commerce, thinks it for its intereſt that they ſhould be rooted out and deſtroyed. The Dutch, whoſe unwearied patience can ſurmount the greateſt obſtacles, have appropriated to themſelves the crop of nutmeg, as well as that of cloves and cinnamon, growing in the iſlands of Ternate, Ceylon, &c. either by right of conqueſt or by paying ſubſidies to the iſlanders, who find theſe much more profitable than the former produce of their trees. It is nevertheleſs true, that they have prevailed upon or compelled the inhabitants of the Moluccas to cut down and root out all the clove-trees, which they have preſerved only in the iſlands of Amboyna and Ternate, which are in a great meaſure ſubject to them. We know for certain, that the Dutch pay 18,000 rix dollars yearly to the king of Ternate, by way of tribute or gift, in order to recompence him for the loſs of his clove-trees in the other Molucca iſlands; and that they are moreover bound by treaty to take at 3¾d. a pound, all the cloves brought by the natives of Amboyna to their magazines. They have likewiſe ſucceeded to deſtroy the cinnamon every where except in the iſland of Ceylon, which is in their poſſeſſion. The ſame is the caſe with white pepper, &c. ſo that the trade of the whole of Europe, and of great part of Aſia in this ſpecies of commodity, paſſes through their hands.

The Dutch have immenſe and very rich magazines of theſe precious aromatics, both in India and Europe. They have actually by them the produce of 16 years, and never ſupply their neighbours with the laſt, but always with the oldeſt crop: in 1760 they ſold what was laid up in 1744. It is commonly ſaid, that when the Dutch have too great a quantity of cloves, nutmeg, &c. in their magazines, they throw them into the ſea; but the fact is, that they get rid of their ſuperfluous aromatics by burning them. On

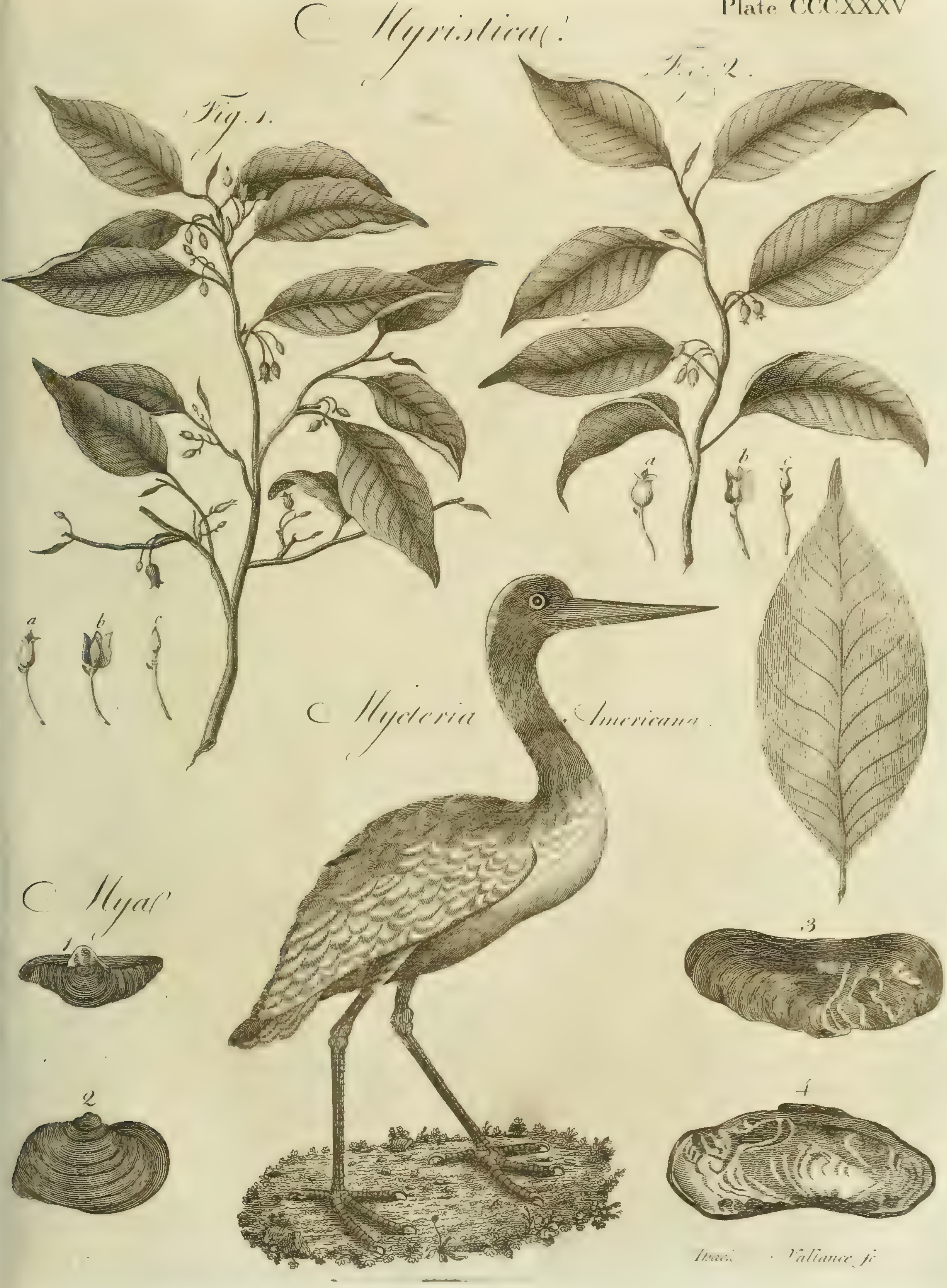
Myristica.

Plate CCCXXXIV



Thackara & Vallance sc.

Plate CCCXXXV



Myrme-cophaga.

the 10th of June 1760, M. Beaumare ſaw at Amſterdam, near the Admiralty, a fire, the fuel of which was valued at 8,000,000 of livres; and as much was to be burned on the day following. The feet of the ſpectators were bathed in the eſſential oil of theſe ſubſtances; but no perſon was allowed to gather any of it, much leſs to take any of the ſpices which were in the fire. Some years before, upon a ſimilar occaſion, and at the ſame place, a poor man who had taken up ſome nutmegs which had rolled out of the fire, was, as M. Beaumare was informed, ſeized and condemned to immediate execution. We will only add, that notwithſtanding the jealouſy of the Dutch, and the pains they take to preſerve the ſale of cloves wholly to themſelves, they have never been able to prevent their own officers in ſeveral parts of India from embezzling and ſelling conſiderable quantities of them. M. de Jaucourt informs us, that in order to defraud the company, they ſell them to the veſſels of other nations which they meet at ſea, and moiſten the remainder with water, that they may ſtill have the number of quintals of which their cargo conſiſted. The quantity ſold may amount to 10 quintals in 100 before it can be perceived by the clerks of the magazines at Batavia, where they are received.

We are informed by M. Romé de Liſle, who has lately arrived from India, that the Engliſh draw a great deal of cinnamon, pepper, and cloves, from the iſland of Sumatra. The ſtaple for this commodity, which gives great offence to the Dutch, is at the factory of Bencoolen. We have likewiſe ſeen a ſpecimen of pretty good cinnamon raiſed at Martinico.—The French, to prevent the exportation of ſpecie for theſe aromatic and exotic productions, have attempted to introduce the culture of them into ſome of their colonies. A great many plants of the clove and nutmeg-tree have been procured, and planted in the Iſle of France, the iſland of Bourbon, and alſo at Cayenne, where they have a very promiſing appearance.

Plate cccxxxvi.

MYRMECOPHAGA, or Ant-bear, in zoology; a genus of quadrupeds, belonging to the order of bruta: There are no teeth in the mouth; the tongue is long and cylindrical; the head terminates in a long ſnout or muzzle; and the body is covered with pretty long hair. There are five ſpecies, viz.

1. The didactyla, or little ant-bear, hath a conic noſe bending a little down; ears ſmall, and hid in the fur; two hooked claws on the fore-feet, the exterior being much the largeſt; four on the hind feet; the head, body, limbs, and upper part and ſides of the tail, covered with long ſoft ſilky hair, or rather wool, of a yellowiſh brown colour: from the noſe to the tail it meaſures ſeven inches and an half; the tail eight and an half, the laſt four inches of which on the under ſide are naked. It is thick at the baſe, and tapers to a point. It inhabits Guinea, climbs trees in queſt of a ſpecies of ants which build their neſts among the branches: has a prehenſible power with its tail.

2. The tridactyla, tamandua-guaca, or tamanoir, has three toes on the fore-feet, five on the hind feet, and long hair on the tail. This animal is about four feet long, and the head and ſnout about 15 inches: it is a native of the Eaſt Indies, and feeds on ants, &c. in the ſame manner as the former.

Myrme-cophaga, Myrmelion

3. The jubata, or great ant-bear, has a long ſlender noſe, ſmall black eyes; ſhort round ears; a ſlender tongue two feet and an half long, which lies double in the mouth; the legs ſlender; four toes on the fore-feet, five on the hind feet; the two middle claws on the fore-feet very large, ſtrong, and hooked; the hair on the upper part of the body is half a foot long, black mixed with grey; the fore-legs are whitiſh, marked above the feet with a black ſpot; the tail is clothed with very coarſe black hair a foot long: the length from the noſe to the tail about four feet; the tail two feet and an half. This animal inhabits South America, and the kingdom of Congo in Africa. It covers itſelf with its tail when aſleep and to guard againſt rain. Its fleſh is eaten by the natives of America.

4. The tetradactyla, or middle ant-bear, has four toes on the fore-feet, and five on the hind, with a tail naked at the extremity; the length from the noſe to the tail is one foot ſeven inches, and the tail ten inches. It inhabits South America.

5. The Capenſis, or Cape ant-bear, has four claws on the fore-paws; a long ſnout; large pendent ears; and a tail which is ſhorter than the body, and taper at the point. It inhabits the country at the Cape of Good Hope.—This animal is much larger than the other ſpecies of the genus, ſo that Kolben compares it to the ſize of a hog, and aſſerts that it weighs 100 pounds. It burrows in the ground, ſleeps during the day, and only goes abroad at night.

Theſe animals have many properties in common with each other, both in their ſtructure and manners. They all feed upon ants, and plunge their tongues into honey and other liquid or viſcid ſubſtances. They readily pick up crumbs of bread or ſmall morſels of fleſh. They are eaſily tamed, and can ſubſiſt for a long time without food. They never ſwallow all the liquor which they take for drink; for a part of it falls back through their noſtrils. They run ſo ſlowly, that a man may eaſily overtake them in an open field.—Their fleſh, though its taſte be very diſagreeable, is eaten by the ſavages. At a diſtance the great ant-eater has the appearance of a fox; and for this reaſon ſome travellers have given him the name of the *American fox*. He has ſtrength ſufficient to defend himſelf from a large dog, or even from the jaguar or Braſilian cat. When attacked, he at firſt fights on end, and like the bear, annoys his enemy with the claws of his fore-feet, which are very terrible weapons.—He then lies down on his back, and uſes all the four feet, in which ſituation he is almoſt invincible; and continues the combat to the laſt extremity. Even when he kills his enemy, he quits him not for a long time after. He is enabled to reſiſt better than moſt other animals, becauſe he is covered with long buſhy hair; his ſkin is remarkably thick; his fleſh has little ſenſation; and his principle of life is very tenacious.

MYRMELION, or Ant-lion, in zoology; a genus of inſects of the neuroptera order. There are 15 ſpecies of which the moſt remarkable is the formicarius, or ant-eater. The perfect inſect is oblong, and of a brown colour. Its head is broad, with two large eyes on the ſides, and two antennæ beneath. The neck is rather long, cylindrical, and narrower than the head. The thorax ſeems compoſed of two parts; one anterior,

rior, whence ariſe the upper wings; and the other poſterior, which, which gives birth to the under ones. The abdomen is of an oblong form, and conſiſts of eight ſegments; the wings are diaphanous, adorned with a net work of black fibres, charged with ſeveral blackiſh brown ſpots. The larva of this inſect is very fond of ants, which it hunts after, whence its name. The larvæ proceed from the egg which the perfect inſect had depoſited in very fine dry ſand, in a place ſheltered from rain, either within a cleft of a wall or of the ground, or at the foot of a wall generally expoſed to the ſouth ſun. There they are hatched, and make their uſual abode. Their colour is grey, and their body, which is covered with ſmall protuberances, is of an oval form. Its poſterior extremity terminates in a point, and is of uſe to ſink itſelf down into the ſand; for it only walks retrogreſſively, though furniſhed with ſix feet. Before the head is placed a dentated forceps, ſharp and hollow within, with which the creature catches and ſucks flies and other inſects, but eſpecially ants. This forceps ſerves as a mouth or roſtrum, as well as for an offenſive weapon. The animal's retrograde march not allowing it to run after the inſects on which it is to feed, it uſes a ſtratagem. It dives down into the ſand, and turning about in a circle, hollows out concentric furrows, gradually deeper and deeper, caſting at a diſtance with its horns the ſand it takes from that place. At length it manages to dig a hole in ſhape like a funnel, at the bottom of which it takes its ſtation, concealed in the ſand, nothing but the open extended forceps appearing above it. Miſchief overtakes every inſect that happens to fall into that hole. The myrmelio who is apprized of it by the grains of ſand rolling down to the bottom, overwhelms him with a ſhower of duſt, which it ejects with its horns, then drags the inſect to the bottom of the hole, where it ſeizes him with its forceps and ſucks its vitals. It does not even ſpare other myrmelions who in their motions to and fro chance to fall into it. When the larva is come to its full growth, it digs no more holes; it moves backwards and forwards tracing irregular furrows on the ſand, and at length ſpins itſelf a cod, ſhaped like a ball, the outward part of which is formed of the ſand in which it lived, and the inward is lined with fine white ſilk. Within this cod it turns to a chryſalis, which is curved into a ſemicircle, and wherein may be diſtinguiſhed all the parts of the perfect inſect that is to iſſue from it. It is more oblong than the larva, but much ſhorter than the perfect inſect. After a certain period the chryſalis caſts off its ſlough, turns to a winged inſect, and breaks through the cod in order to take its flight. The perfect inſect is very ſcarce, but is ſometimes met with in ſandy places, and near rivulets.

Barbut's Genera of Inſects, p. 223.

MYRMIDONS (Myrmidones), in antiquity; a people on the ſouthern borders of Theſſaly, who accompanied Achilles to the Trojan war. They received their name from Myrmidon, a ſon of Jupiter and Eurymeduſa, who married one of the daughters of Æolus ſon of Helen. His ſon Actor married Ægina the daughter of Aſopus. He gave his name to his ſubjects, who dwelt near the river Peneus in Theſſaly. According to ſome, the Myrmidons received their name from their having ariſen from ants or piſmires, upon a prayer put up for that purpoſe by king Æacus to Jupiter, after his kingdom had been diſpeopled by a ſevere peſtilence. According to Strabo, they received it from their induſtry, becauſe they imitated the diligence of the ants, and like them were indefatigable, and were continually employed in cultivating the earth.

MYRMILLONES, were gladiators of a certain kind at Rome, who fought againſt the Retiarii. Their arms were a ſword, head-piece and ſhield. On the top of the head-piece they wore a fiſh emboſſed, called Μορμυρος, whence their name is by ſome ſuppoſed to be derived. The Retiarii, in their engagements, made uſe of a net, in which they endeavoured to entangle their adverſaries, and ſung during the fight, "*Non te peto, piſcem peto; quid me fugis, Galle?*" I aim not at thee, but I aim at thy fiſh; why doſt thou ſhun me, O Gaul?" The myrmillones were called Galli, becauſe they wore Gallic armour. They were alſo named *Secutores*. This kind of gladiators was ſuppreſſed by Caligula. See Gladiators, Retiarii, &c.

MYROBALANS, a kind of medicinal fruit brought from the Indies, of which there are five kinds. 1. The citrine, of a yellowiſh red colour, hard, oblong, and the ſize of an olive. 2. The black, or Indian myrobalan, of the bigneſs of an acorn, wrinkled, and without a ſtone. 3. Chebulic myrobalans, which are of the ſize of a date, pointed at the end, and of a yellowiſh brown. 4. Emblic, which are round, rough, the ſize of a gall, and of a dark brown. 5. Belleric, which are hard, round, of the ſize of an ordinary prune, leſs angular than the reſt, and yellow. They are all ſlightly purgative and aſtringent. The word comes from the Greek μυρον, "ointment," and βαλανος, "acorn, as being in the form of acorns, and uſed in medicine.

MYRON, an excellent Grecian ſtatuary, flouriſhed 442 B. C. The cow he repreſented in braſs was an admirable piece of workmanſhip, and was the occaſion of many fine epigrams in Greek.

MYROXYLON, in botany: a genus of the monogynia order, belonging to the decandria claſs of plants. The calyx is campanulated; the ſuperior petal larger than the reſt; the germ is longer than the corolla; the legumen monoſpermous. There is but one ſpecies, the peruiferum, a native of Peru and the warmer parts of America. It is this ſhrub that yields the balſam of Peru, which is ſaid to be extracted from it by coction in water. This balſam, as brought to us is nearly of the conſiſtence of thin honey, of a reddiſh brown colour inclining to black, an agreeable aromatic ſmell, and a very hot biting taſte. Diſtilled with water, it yields a ſmall quantity of a fragrant eſſential oil of a reddiſh colour, and in a ſtrong fire, without addition, a yellowiſh red oil. Balſam of Peru is a very warm aromatic medicine, conſiderably hotter and more acrid than copaiva. Its principal effects are to warm the habit, to ſtrengthen the nervous ſyſtem, and attenuate viſcid humours. Hence its uſe in ſome kinds of aſthmas, gonorrhœas, dyſenteries, ſuppreſſions of the uterine diſcharges, and other diſorders proceeding from a debility of the ſolids or a ſluggiſhneſs and inactivity of the juices. It is alſo employed externally, for cleanſing and healing wounds and ulcers, and ſometimes againſt palſies and rheumatic pains.—There is another ſort of balſam of Peru of a white colour, and conſiderably more fragrant than the former. This is very rarely brought to us. It is ſaid to be the produce of the ſame plant which yields the common or black balſam, and to exſude from inciſions made in the trunk, while the former is obtained by boiling. There is alſo a third kind, commonly called the red or dry. This is ſuppoſed to obtain a different ſtate from the white, merely in conſequence of the treatment to which it is ſubjected after it is got from the tree. It is almoſt as fragrant as the balſam of Gilead, held in ſo high eſteem among the eaſtern nations. It is very rarely in uſe in Britain, and almoſt never to be met with in the ſhops.

MYRRH, a gummy-reſinous concrete juice, obtained from an oriental tree of which we have as yet no certain account. It comes over to us in globes or drops, of various colours and magnitudes. The beſt ſort is ſomewhat tranſparent, friable, in ſome degree unctuous to the touch, of an uniform browniſh or reddiſh-yellow colour, often ſtreaked internally with whitiſh ſemicircular or irregular veins; of a moderately ſtrong, not diſagreeable ſmell; and a lightly pungent, very bitter taſte, accompanied with aromatic flavour, but not ſufficient to prevent its being nauſeous to the palate. There are ſometimes found among it hard ſhining pieces, of a pale yellowiſh colour, reſembling gum-arabic, of no taſte or ſmell: ſometimes maſſes of bdellium, darker coloured, more opaque, internally ſofter than the myrrh, and differing from it both in ſmell and taſte: ſometimes an unctuous gummy reſin, of a moderately ſtrong ſomewhat ungrateful ſmell, and a bitteriſh very durable taſte, obviouſly different both from thoſe of bdellium and myrrh: ſometimes likewiſe, as Cartheuſer obſerves, hard compact dark coloured tears, leſs unctuous than myrrh, of an offenſive ſmell; and a moſt ungrateful bitterneſs, ſo as, when kept for ſome time in the mouth, to provoke reaching, though ſo reſinous, that little of them is diſſolved by the ſaliva. Great care is therefore requiſite in the choice of this drug.

We have, as already obſerved, no certain information concerning the tree from which this ſubſtance flows; we are only told that the myrrh-tree, or plant, is a native of Abexim in Ethiopia, and is named *bedoins* by the Arabs. It is affirmed by ſome that the myrrh we have at preſent is not equal in quality to that of the ancients, and has not that exquiſite ſmell which all authors aſcribe to the latter. They aromatized their moſt delicious wines with it; and it was preſented as a very valuable perfume to our Lord while he lay in the manger (A). But to this it may be eaſily anſwered, that there is no diſputing about perfumes any more than about taſtes and colours. Men are equally changeable with regard to ſmells, of which we have ſtriking examples in muſk and civet (B). The ancients reckoned two kinds of myrrh: the one li-

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(A) It was this gum alſo which was mingled with the wine given him to drink at his paſſion, to deaden his pains, and produce a ſtupor. (See Mark xv. 23.) The gall mentioned on the ſame occaſion by St Matthew is probably the ſame with myrrh; for any thing bitter was uſually diſtinguiſhed by the name of gall. The Hebrews were accuſtomed to give thoſe that were executed ſome ſtupefying draught. The difficulty which ariſes from the ſeeming difference betwixt the two evangeliſts, by ſome is ſolved by ſaying, that St Matthew, writing in Syriac, made uſe of the word *mara*, which ſignifies "myrrh, bitterneſs, or gall;" but the Greek tranſlator has taken it for gall, and St Mark for myrrh. Others will have it, that our Saviour's drink was mingled with myrrh, as a ſtupefying drug; but ſuppoſe that the ſoldiers, out of wanton cruelty and inhumanity, infuſed gall; which was the reaſon, ſay they, why, when he had taſted, he refuſed to drink.

(B) In the *Journal de Phyſique*, &c. *Suppl.* tom. xiii. 1778, we find ſome remarks on myrrh, made by Mr Bruce while in Abyſſinia, of which the following is a ſtatement: The ſame remarks have been ſince publiſhed in the Appendix to his Travels. The ancients, and particularly Dioſcorides, who ſpeak of myrrh, ſeem never to have ſeen it; or at leaſt that which they have ſeen and deſcribed is altogether unknown to modern phyſicians and naturaliſts. The Arabians, however, who form the intermediate link in the chain between the Greek phyſicians and thoſe of our days, among whom this ſubſtance grew, and from whom it received its name, afford an inconteſtible proof that the myrrh with which we are acquainted is in no reſpect different from that of the ancients, being produced in the ſame countries from which the Greeks formerly procured theirs; that is, on the eaſtern ſhores of Arabia Felix; on the coaſts of the Indian ocean; and on that part of Lower Abyſſinia which lies to the ſouth eaſt of the Red-ſea, nearly between the 12th and 13th degrees of north latitude, bounded on the weſt by a meridian running through the iſland of Maſſovia, and on the eaſt by one which paſſes through cape Guardſey in the ſtraits of Babel-mandel. This region the Greeks called *Troglodytria* and muſt be diſtinguiſhed from the country of the Troglodites, a nation different in every reſpect, and inhabiting the foreſts between Abyſſinia and Nubia. The Abyſſinian myrrh was always more valued than that of Arabia; and this preference it ſtill retains to the preſent day. That part of Abyſſinia being partly overflowed with water, and partly deſert and over-run by a barbarous nation from the ſouth, the Arabians have very little intercourſe with it except by means of ſome Mahometan merchants, whoſe deſperate adventures, undertaken on chance, ſometimes turn out well, but oftener prove very unfortunate. The iſland of Maſſova is the common medium of exportation for the Troglodite myrrh; but ſo little is brought from it in compariſon with what is ſent from Arabia to Grand Cairo, that this is certainly the only reaſon which can be aſſigned for the inferiority of our myrrh to that of the ancients, who received it from Abyſſinia. Although theſe barbarians employ the gum, leaves, and bark of this tree in many diſeaſes to which they are ſubject, as it is the moſt common tree in the country, they nevertheleſs cut it down and burn it for domeſtic purpoſes; and as they never plant new trees to replace thoſe which they have cut down, it is probable that in a few years quid, which they called *ſtacté* or *ſtarti*; the other was ſolid, and went by the name of *troglodyte myrrh*. The ſtacté was procured by inciſion, and was received in veſſels very cloſely ſhut. Large pieces ſometimes preſent externally, or contain a kind of oily juice to which likewiſe the moderns give the name of *Stacté*. To prevent this juice from hardening, or at leaſt in a very ſmall degree it is ſufficient to exclude it from the contact of the air immediately after its iſſuing from the tree; and by theſe means its aromatic nature will be much better preſerved (c).

The medical effects of this aromatic bitter are to warm

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the tree Troglodite myrrh will be entirely loſt; and the erroneous deſcriptions of the ancient Greeks will lead poſterity, as it has done us, to form many miſtaken conjectures concerning the nature of the myrrh of the ancients.

Though the Troglodite myrrh was ſuperior to every ſpecies of Arabian myrrh, the Greeks plainly perceived that it was not all of the ſame quality. Pliny and Theophraſtus affirm, that this difference was owing to the trees, ſome of which were wild, and others meliorated by culture: but this is a mere conjecture; for the truth is that none of them are cultivated. The quality of the drug formerly depended, and muſt ſtill depend, on the age and ſoundneſs of the tree, on the way of making the inciſion, and on the ſeaſon of the year, and the temperature of the air when the myrrh is gathered. To have the firſt and moſt perfect kind of myrrh, the natives ſelect a young vigorous tree, free from moſs or any other plant adhering to the bark and make a deep inciſion with a hatchet above the firſt large branches. What runs from this wound the firſt year, is myrrh of the firſt growth, and is never plentiful. This operation is performed ſome time after the rains have ceaſed, that is from April to June: and the myrrh is produced in July and Auguſt. At each return of the ſeaſon, the ſap continues to run in the courſe to which it has been accuſtomed; but the tropical rains, which are very violent, and which laſt for ſix months, convey ſo much filth and water into the inciſion, that by the ſecond year the tree begins to rot at that place; ſo that the myrrh is of a ſecondary quality, and at Cairo does not bring ſo great a price by a third as the myrrh of the firſt year. That which iſſues from inciſions near the roots and in the trunks of old trees is of the ſecond growth and quality, and ſometimes worſe; but it is reckoned good myrrh in the ſhops of Italy every where except Venice. It is of a red blackiſh colour, dirty, ſolid, and heavy. It loſes very little of its weight by being long kept, and can ſcarcely be diſtinguiſhed from that of Arabia Felix. The third and worſt kind is that which flows from old inciſions formerly made in old trees, or which not having been at firſt obſerved, has remained a whole year upon the tree. It is black, heavy, and of an earthy colour: it has little ſmell and bitterneſs, and is probably the *caucalus* of the ancients.

Myrrh newly gathered has always a ſtrong ſmell of rancid oil; and when put into water, globules of an oily ſubſtance are detached from it, which riſe and ſwim on the ſurface. This oilineſs does not ariſe from the myrrh, but from being put by the natives into goats ſkins, which they anointed with butter to make them pliant. It is kept in theſe ſkins, and thus carried to market: ſo that inſtead of being a fault, as ſome ſuppoſe, it is a proof that the myrrh is newly gathered; which is the beſt property that myrrh of the firſt kind can have. Beſides, this oily covering muſt have retained the volatile particles of the freſh myrrh, which eſcape in ſuch abundance as frequently to occaſion a conſiderable diminution in the weight.

(c) Pliny ſpeaks of the ſtarti as a recent or liquid myrrh: and Dioſcorides, chap. 67. ſays nearly the ſame thing. Mr Bruce is of opinion (but we think he is miſtaken), that the ancient Greeks and Romans, who lay at ſo great a diſtance, could never have it in that ſtate; becauſe he was aſſured by the natives, that it hardened on the tree as ſoon as it was expoſed to the air; and becauſe, though he was near the place where it grows, he never ſaw it ſofter than it is commonly found. Dioſcorides mentions likewiſe a ſpecies of myrrh, which, he ſays, is green, and has the conſiſtence of paſte. Serapio and the Arabians affirm, that ſtarti was a preparation of myrrh diſſolved in water: hence Mr Bruce conjectures, that this green unknown ſpecies was likewiſe a compoſition of myrrh and ſome other ingredient; and by no means a kind of Abyſſinian myrrh which they could never ſee either green or ſoft. The ſame author ſuppoſes, that *apocalbaſum*, or gum of Saſſa and myrrh, are one and the ſame ſubſtance; and he alleges, that Arabic myrrh may be diſtinguiſhed from myrrh of Abyſſinia in the following manner: A handful of the very ſmall pieces which are found at the bottom of the packet containing the myrrh, is thrown into a baſon with a ſufficient quantity of warm water to cover them. Here the myrrh remains for ſome time without any perceptible change, becauſe it diſſolves ſlowly; whereas the gum ſwells to five times its original ſize, and appears like ſo many white particles among the myrrh. But nothing can be inferred from this diſtinction. Does the Arabian myrrh diſſolve, and that of Abyſſinia ſwell? In that caſe the Arabian myrrh would act like pure gum Arabic, or acacia gum, and that of Abyſſinia like gum tragacanth. To us it appears, that Mr Bruce, of whoſe zeal and labours in other reſpects we entertain a high opinion, has not performed his experiments with ſufficient care; or if there was no miſtake in them, we muſt be allowed to think, that the ſuppoſed myrrhs which he employed were nothing but a mixture of Arabian gum acacia, and gum of Baſſora, or Egyptian tragacanth. We are more inclined to be of this opinion, when he ſays that the branches, leaves, and bark of the myrrh trees were brought to him by naked ſavages from the country of the Troglodites; and that he found that the leaves and bark bore a great reſemblance to the acacia vera. Among theſe leaves he obſerved ſome ſtraight prickles, about two inches in length. He likewiſe mentions, that he ſaw a ſaſſa tree which was a native of the myrrh country, and covered with beautiful crimſon-coloured flowers. We know that the ſhrub which produces the gum tragacanth is prickly, and has flowers of purple colour.

warm and ſtrengthen the viſcera: it frequently occaſions a mild diaphoreſis, and promotes the fluid ſecretions in general. Hence it proves ſerviceable in languid caſes, diſeaſes ariſing from a ſimple inactivity, thoſe female diſorders which proceed from a cold, mucous, ſluggiſh indiſpoſition of the humours, ſuppreſſions of the uterine diſcharges, cachectic diſorders, and where the lungs and thorax are oppreſſed by viſcid phlegm. Myrrh is likewiſe ſuppoſed in a peculiar manner to reſiſt putrefaction in all parts of the body; and in this light ſtands recommended in malignant, putrid, and peſtilential fevers, and in the ſmall-pox; in which laſt it is ſaid to accelerate the eruption.

The preſent practice does not ſeem to expect any peculiar virtue from myrrh; and it is now perhaps leſs employed than formerly. Some late writers, however, and particularly Dr Simmons, in his treatiſe on Conſumptions, have beſtowed very high encomiums on it, even in caſes of tuberculous phthiſis; and although it can by no means be repreſented as a remedy much to be depended on, yet there is reaſon to believe that it has been ſerviceable in ſome caſes.

Rectified ſpirit extracts the fine aromatic flavour and bitterneſs of this drug, and does not elevate any thing of either in evaporation: the gummy ſubſtance left by this menſtruum has a diſagreeable taſte, with ſcarcely any of the peculiar flavour of the myrrh: this part diſſolves in water, except ſome impurities which remain. In diſtillation with water, a conſiderable quantity of a ponderous eſſential oil ariſes, reſembling in flavour the original drug. Myrrh is the baſis of an officinal tincture. It enters the pilulæ ex aloe et myrrha, the pilulæ e gummi, and pilulæ ſtomachicæ, and ſome other formulæ. But for obtaining its full effects, it muſt be given in doſes of half a dram or upwards; and it is thought to be advantageouſly united with a proportion of nitre, cream of tartar, or ſome other refrigerant ſalt.

MYRRHINE, or MURRINE. See MURRINE.

MYRSINE, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The corolla is ſemiquinquefid and connivent: the germen filling the corolla: the berry quinquelocular and pentaſpermous.

MYRTIFORM, in anatomy, an appellation given to ſeveral parts, from their reſembling myrtle-berries.

MYRTIS, a Greek woman who diſtinguiſhed herſelf by her poetical talents. She flouriſhed about 500 years before the Chriſtian era, and inſtructed the celebrated Corinna in the ſeveral rules of verſification. Pindar himſelf, as ſome report, was alſo one of her pupils.

MYRTLE, in botany. See MYRTUS.

MYRTOUM MARE, a part of the Ægean ſea, lying between Eubœa, Peloponneſus, and Attica. It receives this name from Myrto a woman, or from Myrtos a ſmall iſland in the neighbourhood, or from Myrtilus the ſon of Mercury who was drowned there, &c.

MYRTUS (anc. geog.), a ſmall iſland near Caryſtus in Eubœa, which gave name to the Mare Myrtoum. Others, according to Pauſanias, derive the appellation from *Myrto*, the name of a woman. Strabo extends this ſea between Crete, Argia, and Attica. Pauſanias beginning it at Eubœa, joins it at Helene, a deſart iſland, with the Ægean ſea. Ptolemy carries it to the Coaſt of Caria. Pliny ſays, that the Cyclades and Sporades are bounded on the weſt by the Myrtoan coaſt of Attica.

MYRTUS, in botany, the *Myrtle*: A genus of the monogynia order, belonging to the icoſandria claſs of plants; and in the natural manner ranked under the 19th order, *Heſperideæ*. The calx is quinquefid, ſuperior; there are five petals; the berry is diſpermous or triſpermous. There are 14 ſpecies, of which the moſt remarkable are,

1. The communis, or common myrtle-tree, riſes with a ſhrubby, upright, firm ſtem, branching numerouſly all around into a cloſe full head, riſing eight or ten feet high; very cloſely garniſhed with oval lanceolate, entire, moſtly oppoſite leaves, from half an inch to an inch and a half long, and one broad, on ſhort footſtalks; and numerous, ſmall, pale flowers from the axillas, ſingly on each footſtalk, having dyaphyllous involucrums; each flower ſucceeded by a ſmall oval, dark purple berry. The moſt material varieties are, broad-leaved Roman myrtle, with oval, ſhining, green leaves, an inch and an half long, and one broad; and which is remarkably floriferous. Gold-ſtriped broad-leaved Roman myrtle. Broad leaved Dutch myrtle, with ſpar-ſhaped, ſharp pointed, dark green leaves, an inch long and about three quarters of one broad. Double-flowered Dutch myrtle. Broad-leaved Jews myrtle, having the leaves placed by threes at each joint: by which particular circumſtance this ſpecies is in univerſal eſtimation among the Jews in their religious ceremonies, particularly in decorating their tabernacles; and for which purpoſe many gardeners about London cultivate this variety with particular care, to ſell to the above people, who are often obliged to purchaſe it at the rate of ſixpence or a ſhilling for a ſmall branch: for the true ſort, having the leaves exactly by threes, is very ſcarce, and is a curioſity; but by care in its propagation, taking only the perfectly ternate-leaved ſhoots for cuttings, it may be increaſed faſt enough; and is worth the attention of the curious, and particularly thoſe who raiſe myrtles for the London markets. Orange-leaved Spaniſh myrtle, with oval ſpear-ſhaped leaves, an inch and a half long or more, and one broad in cluſters round the branches, and reſemble the ſhape and colour of orange-tree leaves. Gold-ſtriped leaved orange myrtle. Common upright Italian myrtle, with its branches and leaves growing more erect, the leaves oval, lanceolate-ſhaped, acute-pointed, and near in inch broad and a half one broad. Silver-ſtriped upright Italian myrtle. White-berried upright Italian myrtle. Portugal acute leaved myrtle, with ſpear ſhaped, oval acute-pointed leaves, about an inch long. Box-leaved myrtle, with weak branches, ſmall, oval obtuſe, lucid green. cloſely-placed leaves. Striped box-leaved myrtle. Roſemary-leaved myrtle, hath erect branches ſmall, narow, lanceolate, acute pointed. ſhining, green, very fragrant leaves. Silver-ſtriped roſemary-leaved myrtle. Thyme-leaved myrtle, with very ſmall cloſely-placed leaves. Nutmeg-myrtle, with erect branches and leaves; the leaves oval, acute-pointed, and finely ſcented like a nutmeg. Broad-leaved nutmeg-myrtle. Silver-ſtriped leaved ditto. Criſtated or cock's-comb myrtle, frequently called *bird's-neſt-myrtle*,

myrtle, hath a narrow, ſharp-pointed leaves, criſtated at intervals. Theſe are all beautiful ever-green ſhrubs of exceeding fragrance; exotics originally of the ſouthern parts of Europe, and of Aſia and Africa, and conſequently in this country require ſhelter of a green houſe in winter: all of which, though rather of the ſmall-leaved kind, have their foliage cloſely placed, and remain all the year, and are very floriferous in ſummer; and when there is a collection of the different ſorts, they afford an agreeable ſource of variety with each other. They therefore claim univerſal eſteem as principal green houſe plants. eſpecially as they are all ſo eaſily raiſed from cuttings, and of ſuch eaſy culture, as to be attainable in every garden where there is any ſort of green houſe, or garden frames furniſhed with glaſſes for protectiong them in winter from froſt: but ſome of the broad-leaved ſorts are ſo hardy as to ſucceed in the full ground, againſt a ſouth wall and other warm expoſures, all the year, by only allowing them ſhelter of mats occaſionally in ſevere froſty weather: ſo that a few of theſe ſorts may alſo be exhibited in a warm ſituation in the ſhrubbery: obſerving, however, all the ſorts are principally to be conſiered as green-houſe plants, and a due portion of them muſt always remain in pots to move to that department in winter.

Plate cccxxxvi. 2. The pimenta, pimento, Jamaica pepper, or all-ſpice tree, grows above 30 feet in height and two in circumference; the branches near the top are much divided and thickly beſet with leaves, which by their continual verdure always give the tree a beautiful appearance: the bark is very ſmooth externally, and of a grey colour; the leaves vary in ſhape and in ſize, but are commonly about four inches long, veined, pointed, elliptical, and of a deep ſhining green colour: the flowers are produced in bunches or panicles, and ſtand upon ſubdividing or trichotomous ſtalks, which uſually terminate the branches; the calyx is cut into four roundiſh ſegments; the petals are alſo four, white, ſmall, reflex, oval, and placed oppoſite to each other between the ſegments of the calyx; the filaments are numerous, longer than the petals, ſpreading, of a greeniſh white colour, and riſe from the calyx and upper part of the germen; the antheræ are roundiſh, and of a pale yellow colour; the ſtyle is ſmooth, ſimple and erect; the ſtigma is obtuſe; the germen becomes a round ſucculent berry, containing two kidney-ſhaped flattiſh ſeeds. This tree is a native of New Spain and the Weſt India iſlands. In Jamaica it grows very plentifully; and in June, July, and Auguſt, puts forth its flowers, which with every part of the tree breathes an aromatic fragrance. The berries when ripe are of a dark purple colour, and full of a ſweet pulp, which the birds devour greedily, and muting the ſeeds, afterwards propagate theſe trees in all parts of the woods It is thought that the ſeeds paſſing through them, in this manner undergo ſome fermentation, which fits them better for vegetating than thoſe gathered immediately from the tree.

The pimento is a moſt beautiful odoriferous evergreen and exhibits a fine variety in the ſtove at all ſeaſons. It was firſt introduced and cultivated in England by Mr Philip Miller in 1739. With reſpect to flowering, all the varieties of the *myrtus communis* flower there in July and Auguſt, moſt of which are very floriferous: the broad leaved Roman kind in particular is often covered with flowers, which in ſome of the ſorts are ſucceeded here by berries ripening in winter. The pimento alſo flowers in the ſtove with great beauty and luxuriance. The flowers of moſt of the ſorts are ſmall, but numerous; and are all formed each of five oval petals and many ſtamina. As all theſe plants require protection in this country, they muſt be kept always in pots, for moving to the proper places of ſhelter, according to their nature; the *myrtus communis* and varieties to the greenhouſe in winter, the pimento and other delicate kinds to the ſtove, to remain all the year: therefore let all the ſorts be potted in light rich earth; and as they advance in growth, ſhift them into larger pots, managing the myrtles as other green houſe ſhrubs, and the ſtove-kinds as other woody exotics of the ſtove.

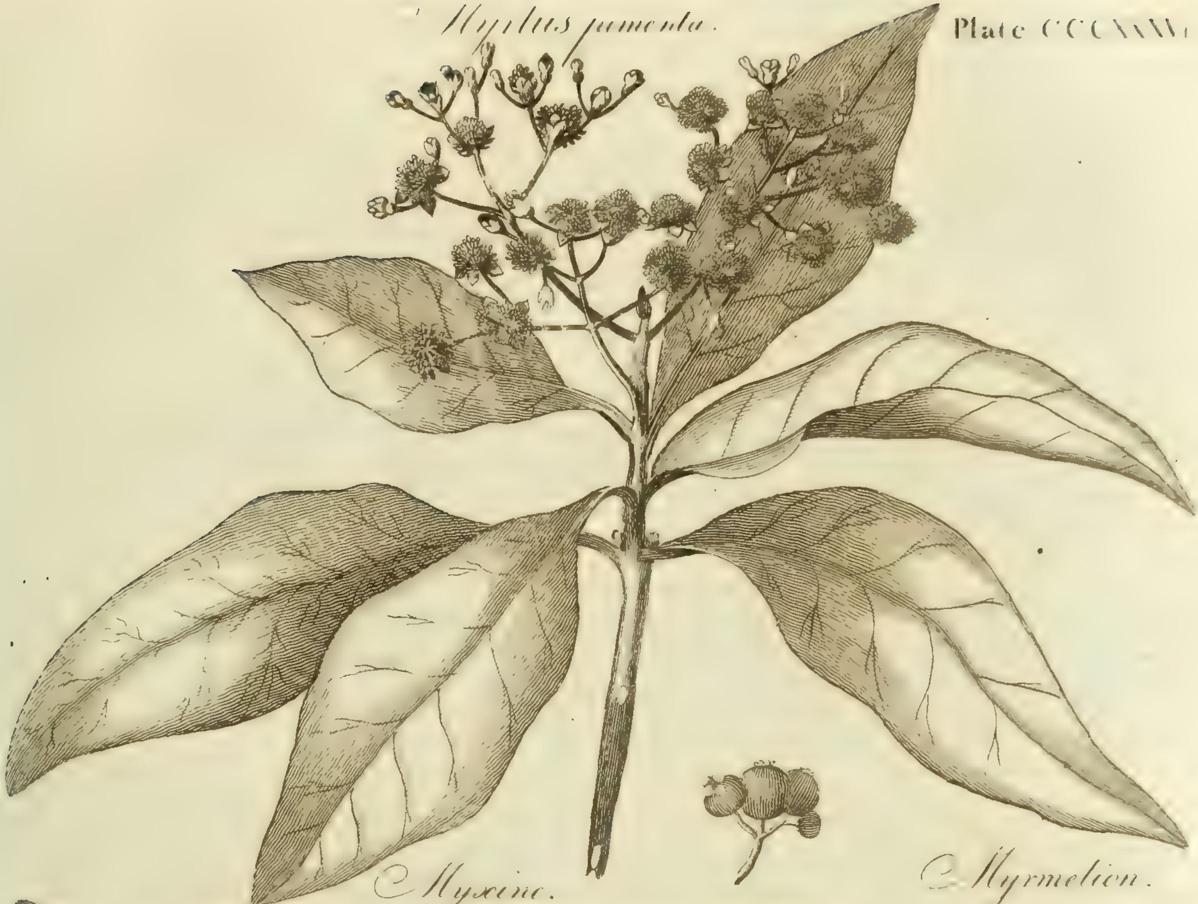
Properties, &c. The leaves and flowers of *common* upright myrtle have an aſtringent quality, and are uſed for cleanſing the ſkin, fixing the teeth when looſened by the ſcurvy, and ſtrengthening the fibres. From the flowers and young tops is drawn a diſtilled water that is deterſive, aſtringent, coſmetic, and uſed in gargles. A decoction of the flowers and leaves is applied in fomentations. The berries have a binding deterſive quality; and the chemical oil obtained from them is excellent for the hair, and uſed in pomatums and moſt other external beautifiers of the face and ſkin. As an internal medicine, theſe berries have little or no merit.

In the *Dictionnaire portatif d'Hiſtoire Naturelle*, a fact is related, which, if true, tends to ſhow the ſtrongly aſtringent quality of myrtle. "Myrtle. (ſays he) is likewiſe the baſe of a pommade called *pommade de la Comteſſe*, and well known on account of an extraordinary hiſtorical fact. One of thoſe gay youths who flutter about the toilets of the fair happened one day to be left alone in the ſtorehouſe of the graces. With eager curioſity he examined the purfumes, the ſmelling bottles, the perfumed powder, the eſſences, and the coſmetics. To give more of the vermillion and greater pliancy to his lips, and to remove ſome diſagreeable eruptions, he lightly ſpreads with his indiſcreet finger the fatal pommade, looks at himſelf in the glaſs, and contemplates his beauty with admiration. The lady enters; he wiſhes to ſpeak, but his lips contracted, and he could only ſtammer. The lady looked at him with aſtoniſhment; at length caſting her eyes on the toilet, ſhe diſcovered by the open pot the cauſe of the miſtake, and enjoyed a hearty laugh at the expence of her admirer, whoſe confuſion announced his indiſcretion."

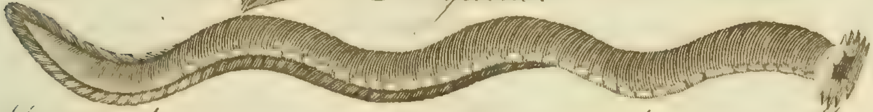
Pimento berries are chiefly imported into Britain from Jamaica; whence the name *Jamaica pepper*. It is alſo called *all-ſpice*, from its taſte and flavour being ſuppoſed to reſemble thoſe of many different ſpices mixed together. It is one of the ſtaple articles of Jamaica; where the pimento walks are upon a large ſcale, ſome of them covering ſeveral acres of ground. When the berries arrive at their full growth, but before they begin to ripen, they are picked from the branches, and expoſed to the ſun for ſeveral days, till they are ſufficiently dried; this operation is to be conducted with great care, obſerving that on the firſt and ſecond, day's

Plate CCCXXXVI.

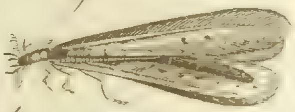
Myrtus pimenta.



Myxine.

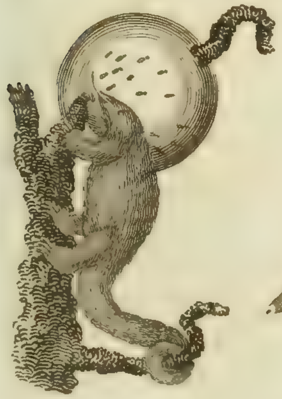


Myrmelion.

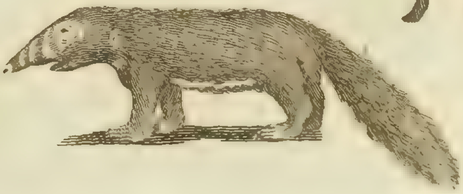


Myrmecophaga.

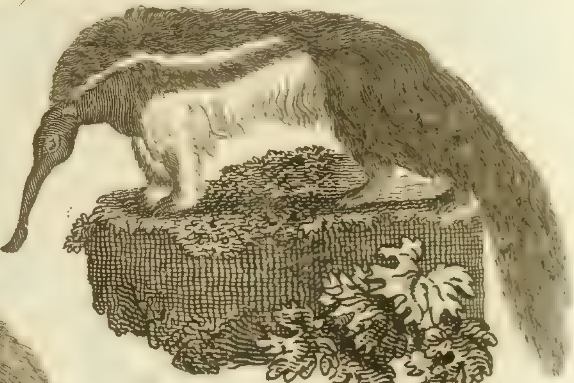
M. didactyla.



M. tetradactyla.



M. jubata.



Trenchard sculp.

expoſure they require to be turned very often, and always to be preſerved from rain and the evening dews. After this proceſs is completed, which is known by the colour and rattling of the ſeeds in the berries, they are put up in bags or hogſheads for the market. This ſpice, which was at firſt introduced for dietetic uſes, has been long employed in the ſhops as a ſuccedaneum to the more coſtly oriental aromatics: it is moderately warm, of an agreeable flavour, ſomewhat reſembling that of a mixture of cloves, cinnamon and nutmegs. Diſtilled with water it yields an elegant eſſential oil, ſo ponderous as to ſink in the water, in taſte, moderately pungent, in ſmell and flavour approaching to oil of cloves, or rather a mixture of cloves and nutmegs. To rectified ſpirit it imparts, by maceration or digeſtion, the whole of its virtue: in diſtillation it gives over very little to this menſtruum, nearly all its active matter remaining concentrated in the inſpiſſated extract. Pimento can ſcarcely be conſidered as a medicine: it is, however, an agreeable aromatic, and on this account is not unfrequently employed with different drugs, requiring ſuch a grateful adjunct. Both the pharmacopœias direct an aqueous and ſpirituous diſtillation to be made from theſe berries, and the Edinburgh college order alſo the *oleum eſſenciale piperis Jamacienſis*.

MYSIA, a country of Aſia Minor, generally divided into Major and Minor. Myſia Minor was bounded on the north and weſt by the Propontis and Bithynia, and Phrygia on the ſouthern and eaſtern borders. Myſia Major had Æolia on the ſouth, Ægean on the weſt, and Phrygia on the north and eaſt. Its chief cities were Cyzicum, Lampſacus, &c. The inhabitants were once very warlike; but they greatly degenerated, and the words *Myſorum ultimus* was emphatically uſed to ſignify a perſon of no merit. The ancients generally hired them to attend their funerals as mourners, becauſe they were naturally melancholy and inclined to ſhed tears. They were once governed by monarchs. They are ſuppoſed to be deſcended from the Myſians of Europe, a nation who inhabited that part of Thrace which was ſituated between Mount Hæmus and the Danube.

MYSON, a native of Sparta, one of the ſeven wiſe men of Greece. When Anacharſis conſulted the oracle of Apollo, to know which was the wiſeſt man in Greece, he received for anſwer, he who is now ploughing his fields. This was Myſon.

MYSORE, or MYSOREAN DOMINIONS, a kingdom of Aſia in the Eaſt Indies, conſiſting of the following territories uſurped or ſubdued by the late Hyder Ali, and tranſmitted to his ſon Tippoo Saib the preſent ſultan.

1. Myſore Proper, or Seringapatam (from its capital), forming the independent ſtate of a Hindoo rajah, for near 200 years from its diſmemberment, as a province of the Bejenagur empire, fell into the hands of Hyder Ali Khan about the year 1763, by cutting off the Delaway, or regent uſurper of the government, and ſeizing the reins of adminiſtration himſelf; but without leaving even the ſhadow of any authority to a nominal rajah of his own creation, excepting in the formularies of juſtice or finance, and preſerving on one ſide of the pagoda coin the impreſſion of two ſwamies or divinities of the Hindoos, while the other was made to bear the initial letter of his proper name Hyder. The whole country now again reduced into the form of a province dependent on the New Myſorean dominion of a Muſſulman in the perſon of Tippoo, is bounded on the weſt by the Balagaut hills of Koork, and thoſe called Anemally, bordering the whole coaſt of Malabar; on the eaſt it frontiers with the Carnatic Payengaut and its dependencies along the Coromandel coaſt; and, on the north, with the pergunnahs of Serah, Bangalore, and Colar, belonging to the Carnatic Balagaut-Bejapoury, in a longitudinal line little ſhort of 200 Engliſh miles. From this latter boundary, in a form nearly triangular, it ſtretches 240 miles towards the ſouth, where it terminates in a point at the extremity of Dindigul, near the paſs of Goodalore, through the Anemally hills, on the confines of Travancore, and within 100 miles of Cape Comorin. It partakes of the two great diviſions of country known in the Decan by the terms Balagaut and Payengaut, or upper and lower region. The former, comprehending the diſtricts immediately dependent on the capital, and 43 ſubordinate forts, chiefly on eminences, is but indifferently watered by the ſeveral branches of the Caveri, at no great diſtance from its ſource; and muſt therefore, as well as in conſequence of an elevated ſituation, precluded from foreign commerce, with ſcarcely any internal induſtry, be comparatively poor, as it is productive only of the ſmaller grains of joary and Bajary, or a ſpecies of Indian corn, with the different kinds of vetches common to India; from all which, however, a nett revenue, in money or kind, of ſeven lacks of hoons or pagodas, being about 27 lacks of rupees, is computed to be forth-coming to the ſtate, after defraying the ordinary charges of collection, which here as in the reſt of Hindoſtan, conſiſt chiefly of an eſtabliſhment of village peons or militia, reckoned 40,000 in number, for the whole province of Myſore ſuppoſed to contain 15,400 ſquare geographic miles. The latter, or Payengaut diviſion, making ſcarcely a third part of this extenſive area, is better known to us under the name of Coimbatore, including the Diſtricts of Caroor, Darampour, and Namcul, on both ſides of the Caveri, with the valley of Dindigul, on the ſouth, and the great paſs of Palligautcherry towards Malabar on the weſt: it is extremely fertile and well cultivated; therefore, in proportion to its extent, more productive of revenue than the Balagaut territory, being eſtimated nett at 19 lacks of rupees. The rajahs of Koork, and other Palygars among the Gauts, from Bidenore ſouth to Dindigul, occupy independently a conſiderable tract of country within the general deſcription of Tippoo's dominions: but which being inacceſſible to regular troops by hills or impervious woods, the Myſorean power hath never been able to conquer, further than to facilitate the catching of a few elephants, yearly by means of the natives.

2. Bedenore, or Ikeri, now Hydernagur, on the diſſolution of the Canarine empire, of which it was a part, became an independent ſtate under its Naicks of the race of Vencataputty, after which it fell under the divided female government of different rannies or queens, and ſo continued until conquered wholly by Hyder between the years 1763-5. This country is alſo divided into Alagaut and Payengaut; the latter

ſtretching 140 miles along the ſea-coaſt from Declah, or the river Cangrecora, being the northern frontier of Malabar, north to Honawar or Onore, on the confines of Soonda, in different breadths of plain territory, from 40 to 50 miles, but which may in all form an area of 3200 ſquare miles, ſtill retaining the ancient name of Canara, and including the ports of Mangalore, Barcelore, Onore, &c. The former or elevated diviſion beyond the Supramanny Gauts, and immediately dependent on the capital Bedenore, Hanampour, &c. is of great indefinite extent inland, on both ſides of the Tumbhudra; perhaps twice more conſiderable in ſize, though not proportionably ſo in value, to the maritime border. Both diviſions, however, allowing for a revenue eſtabliſhment of about 22,000 village peons, are aſſeſſed for ſeven lacks of Ikeri pagodas, which, at four rupees each, make a clear income to the exchequer of 28 lacks of rupees.

3. Soonda, in circumſtances of hiſtory or final conqueſt, might be placed under the preceding head; as alſo from a ſimilarity in its geographical deſcription, with only the difference of being on a much ſmaller ſcale. The Payegaut, from the diſtrict of Onore to the frontiers of Goa, along a ſea-coaſt of 60 miles, cannot comprehend above 1100 ſquare miles of territory, in which the port of Carwar may be conſidered the capital; while a much larger extent muſt be allowed for that portion of the diſtrict beyond the Gauts to the eaſtward. The whole revenue, however, of both diviſions, does not exceed two lacks of pagodas, or eight lacks of rupees.

4. Malabar. The country under this deſcription, and conquered by Hyder in 1765-6, excluſive of Koork, is altogether Payengaut; ſtretching along the ſhore from Declah ſouth to Cochin about 200 miles, and comprehending, in an area of perhaps 6000 ſquare miles, the Samery's territory of Calicut, with the petty ſtates of Cartinad, Cotiotie, Cherica, or Cananore, on the north, and the tributary kingdom of Cochin on the ſouth;—the whole rated at a revenue of five lacks of pagodas, or about 19 lacks of rupees, after allowing for the maintenance of 18,000 village peons.

5. Barah Mhal, or twelve pergunnahs, was one of the earlieſt conquered annexations of Hyder to the Myſorean dominion, though in the war of 1768 it was over-run and for a while in poſſeſſion of the company's troops. The whole circar or diſtrict of Jugdeo, compoſed of heights and valleys on the confines of the Balagaut and Payengaut Carnatics, being one of the ſeven dependencies of Guije ſubjected to the Mogul in 1698, was then ſubdivided into 17 pergunnahs, and aſſeſſed for a groſs revenue of 1,757,717 rupees. Of theſe ſubdiviſions, Amboor, Sautgur, &c. remain to the Payengaut: the reſt in the hands of Tippoo, may comprehend, excluſive of the poligarry of Shili Naick, about 1800 ſquare miles; but the nett revenue of the ſame territory, after defraying the ordinary expences of collection, does not exceed five lacks of rupees at preſent.

Theſe five provinces of the Myſorean empire, with the diſtricts of Bangalore, Colar, &c. of the Carnatic-Balagaut Bejapoory, formed the whole of Hyder's dominion in the war 1768; and were calculated then to yield in all a net income of 119 lacks and an half of rupees, allowing an eſtabliſhment of 115,000 village peons to enforce the collections, and maintain internal peace.

6. Petty ſtates of Hindoo rajahs, ſituated on the weſt and north of the Hendery and Tumbhudra rivers, to the confines of Goa, and the Merhatta territories of Toorgul, Raibaug, and Meritch, forming the jageer of Perſeram Bow beyond the ſouthern branch of the Kiſtnah. Some of theſe rajahſhips had been entirely conquered by the Mogul; but the moſt conſiderable of them never were ſubdued by any Muſſulman power until Hyder's conqueſt of them between the years 1774-7, though different diſtricts from each may have been diſmembered for a while by the Mogul deputies of the Carnatic-Balagaut Bejapoory, and therefore annexed in the accounts of the revenue of that circar. The frontier forts, and dependencies, of Goojunder-gur, Darwar, Badamy, &c. near the ſouthern branch of the Kiſtnah towards the Merhattah dominion, compoſed at one time the jageer of Ragenaut Row, and have frequently changed their maſters. They fell ultimately to Tippoo at the peace of 1784, but he was forced to pay chout for them to the Peſhwa. On the whole, all theſe ſtates, of great indefinite extent and extremely poor, yield only a precarious revenue of 16 lacks of rupees to the Myſorean.

7. Carnatic Balagaut Bejapoory, conſiſting, under the Mogul, of one circar of the ſame name, and of which the capital was Serah. It comprehended 51 pergunnahs, of which Bangalore, Colar, &c. on the ſouth, were ſeized by Hyder, immediately when he poſſeſſed himſelf of Myſore; but Anantpour, Penekonda, &c. on the north, with the reſt of the Merhattah ſtate of Gooty, did not fall into his hands until the year 1776, when he overcame and made priſoner the proprietor Morarow, who had rendered ſignal ſervice to the Engliſh in the preceding Myſorean war. The whole circar was rated at a jumma *kaumil*, or total groſs revenue on the king's books, of 43,916,396 rupees: but the accuracy of this valuation is much to be doubted: becauſe it does not appear from the regiſters of the ſoubah of Bejapour that the Mogul government ever aſcertained the *dehatee* or village collections of either of the Carnatics, or went into greater detail than to fix the ſtandard aſſeſſment of the different pergunnahs; and becauſe the amount thus ſtated ſeems too large a receipt from a country naturally ſo poor and deſtitute of commerce, probably in all its dimenſions not exceeding 10,000 ſquare miles, and which was ſo liable to internal diſturbances or foreign invaſion, that notwithſtanding the number of ſtrong holds to be found in it, every town required and has its own particular fortification. However this may be, the revenue actually forthcoming to Hyder in 1778, after defraying charges of collection and an eſtabliſhment of about 30,000 village peons, was only 3,205,206 rupees.

8. Carnatic-Balagaut-Hydrabady, comprehending the five circars of Sidhout, Kahmam, Ganjecottah, Gooty, and Gorrumkonda, which were ſubdivived into 66 pergunnahs, rated by the Moguls kaumils 4,707,306 rupees: but from this amount is to be deducted the aggregate valuation of the pergunnahs or Chittoor, &c. now annexed to the Payengaut, together with the aſſeſſment of the diamond-mines of Ganjecottah,

Myſore. jecottah, which are no longer productive, making in all an object of two lacks of rupees. The whole country thus deſcribed, bounded by the circars of Adoni and Nundial on the north towards the Kiſtnah, the Guntour circar and Carnatic Payengaut on the eaſt, with that of the Balagaut Bejapoury on the ſouth and weſt, may in ſquare dimenſions be nearly equal to this laſt mentioned diviſion of territory of about 10,000 ſquare miles. It formed the inheritances for four generations of the Patan nabobs of Cuddapah, deſcended from a collateral branch of the Sanore family, until Gooty and Gorrumkonda were taken by the Merhattahs in 1758, and then ultimately, with the remainder of Helim Khan's poſſeſſion, by Hyder in 1776-9. After deducting the amount of a few jageers and ſome charitable land ſtill left to the Mahomedans of this diſtrict, with the expence of an eſtabliſhment at leaſt of 23,000 village peons, the net revenue of the whole province may be eſtimated at 29 lacks of rupees.

9. Adoni, or circar of Imtiazghur on both ſides of the Hendery river, ſouth of the Tumbhudra or Tungubudra river, as far as and incluſive of Bellary, together with a ſmall portion of the circar of Ghazipour or Nundial, diſmembered from the nabobſhip of Karnool, all ſituated in the ſoubah of Bejapour, comprehend the whole of Tippoo's conqueſts and annexation to the Myſorean empire, acquired ſince the death of Hyder, and ſubſequently to the treaty of Mongalore in 1784. In extent and revenue, this acquiſition may be conſidered of little account. The former cannot exceed 5000 ſquare miles, and the latter ſcarcely ſeven lacks of rupees, reckoning the petty zemindary of Bellary. But the fort of Adoni is of a conſiderable importance, as being of the kind (on an inſulated rock) thought the ſtrongeſt in Hindoſtan, without excepting Dowlatabad or Gualior. It was ever the favourite ambitious object of conqueſt to Hyder, the Merhattas and Nizam; and preſerved only through the cautious policy of its proprietor, Baſſalut Jung. When it came by inheritance into the weak inexperienced hands of his ſon Mohabet Jung, it fell by treachery under the dominion of Tippoo; together with all its territorial dependencies, except the circar of Raichore, between the Kiſtnah and Tumbhudra.

The extent of Tippoo's dominion, according to the lateſt maps, has been computed at 80,000 ſquare geographic miles, or 92,666 Engliſh. Thus conſidering it a triangle, of which the baſe runs nearly parallel to and not far ſouth of the Kiſtnah, in a longitudinal line of 340 Engliſh miles, about the 16th degree of north latitude, or from the pagoda of Tripanti in the north-eaſt angle to Kittoor in the north-weſt. Towards the frontiers of Goa, of Bari, and the Merhattahs; then, one of its ſides, along the Balagaut or mountainous ridge of the Malabar coaſt, will be found to ſtretch in a horizontal diſtance 500 miles ſoutherly to the extreme point and paſs of Goodalore in that quarter; and its other ſide from thence northerly, touching the frontiers of the Carnatic Payengaut, 470 miles in a parallel direction to the Coromandel coaſt, until it reaches the further corner of the circar of Kahmam near the firſt mentioned point at the pagoda of Tripanti. Beyond theſe three lines, the plains bordering the ſhores of Canara aad Malabar are the only excluſive territory of conſiderable extent belonging to Tippoo: and to balance it in ſome degree, within the area of the triangle deſcribed, it is to be remembered are ſituated the independent or environed ſtates of Sanore, Koork, &c. if not alſo a part of Karnool and Raichore. As the whole face of the country is known to be rugged, in many parts deſolate, badly watered, and generally riſing abruptly near half a mile of perpendicular height above the level of the ſea; it cannot be ſuppoſed that the ſoil is equally fertile with the lower lands of Hindoſtan. In fact, though every advantage of induſtry and population be allowed to a deſpotic government, which cheriſhes a numerous peaſantry in excluſion of great intermediate landholders, yet the produce of the Balagaut altogether conſiſts merely of the neceſſaries of life, and theſe of the coarſeſt kind; juſt enough to ſubſiſt the inhabitants, after making ſufficient proviſion in paſture for the extraordinary number of horſes and other cattle maintained there for the military eſtabliſhment; while, in the Payengaut on the Malabar coaſt, ſome pepper, cardamums, ſandal wood, and ſurplus grain beyond internal conſumption, conſtitute the only commercial funds of natural growth within the whole circle of the Myſorean dominion. As to manufactures, except thoſe of Salem and Bellary, if any exiſt in the country, they are not conſiderable enough to be known abroad.

From the foregoing view of the nature, produce, and revenues of the Myſorean empire, it may be concluded that the Engliſh could have no lucrative proſpects in their late conteſt with Tippoo Sultan; but were compelled, for the preſervation of their own poſſeſſions in that quarter, to undertake his reduction as a reſtleſs, cruel, ambitious, and depradatory neighbour. This has accordingly been effected by the good conduct of Lord Cornwallis; who, in the iſſue of the war, has obliged him to cede half his dominions to the Company and its allies, adjacent to their reſpective boundaries, and ſubject to their ſelection.

MYSTERIES.

1 The gradual introduction of myſteries into religion.

RELIGION, in its original form, was ſimple and intelligible. It was intended for the inſtruction and edification of all ranks of men; and of conſequence its doctrines were on a level with vulgar capacities. The Jewiſh diſpenſation was openly practiſed: nothing was performed in ſecret; every article was plain, open, and acceſſible. The divine author of the Chriſtain œconomy commanded his diſciples to preach his doctrine in the moſt public manner; "What ye have heard in ſecret (ſays he) preach openly; and what I have taught you in private teach ye publickly, and proclaim it on the houſe-tops:" Such are the charms of truth, and ſuch the character of that religion which came down from heaven, that they, as it, were, "delight in the light, and liſt up their voice in the ſtreets, and cry in the chief places of concourſe."

But ſuch is the depravity of the nature of man, that the nobleſt inſtitutions degenerate in his hands. Religion itſelf, originally pure, ſimple, and amiable, under his management has often been transformed into pollution, perplexity, and deformity. The miniſters of religion, whoſe province it was to guard the ſacred depoſit, and to ſecure it from foreign and ſpurious intermixtures, have generally been the firſt innovators, and the firſt and moſt induſtrious agents in corrupting its integrity and tarniſhing its beauty. Avarice and ambition prompted that claſs of men to deviate from the original plainneſs and ſimplicity of religious inſtitutions, and to introduce articles, rites and uſages, which might furniſh them with opportunities of gratifying theſe unhallowed and inſatiable paſſions. Hence diſtinctions unknown to pure and undefiled religion were fabricated, and that heavenly inſtitution, heretofore one, ſimple, indiviſible, was divided into two partitions: the one popular and public: the other dark, ſecret, and myſterious. The latter of theſe we intend as the ſubject of this article.

2 Etymology and import of the terms. The Engliſh word *myſtery* is derived from the Greek μυϛηριον; and in its modern acceptation imports ſomething above human intelligence, ſomething awfully obſcure and enigmatical; any thing artfully made difficult; the ſecret of any buſineſs or profeſſion. The word is often uſed by the founder of the chriſtian religion, and more frequently by his apoſtles, eſpecially St Paul. In theſe caſes, it generally ſignifies thoſe doctrines of Chriſtianity which the Jews, prior to the advent of the Meſſiah, either did not or could not underſtand. The favourite doctrines of the Trinity in Unity, and the Unity in Trinity; the union of two natures in one and the ſame perſon, &c. were generally called *myſteries*, becauſe they were thought infinitely above human comprehenſion. All theſe ſignifications are out of the queſtion at preſent. 3 Object of this article. Our intention in this article is to lay before our readers the fulleſt and faireſt account we have been able to collect, of thoſe αποῤῥητα, or *ſecret rites*, of the pagan ſuperſtition, which were carefully concealed from the knowledge of the vulgar, and which are univerſally known under the denomination of *myſteries*.

The word Μυϛηριον is evidently deduced from Μυϛηρ; but the origin of this laſt term is not altogether ſo obvious. The etymologies of it exhibited by the learned are various; ſome of them abſurd and inconſiſtent, others fooliſh and futile. Inſtead of fatiguing our readers with a detail of theſe, which would be equally unentertaining and unintereſting, we ſhall only produce one, which to us appears to come neareſt the truth. The myſteries under conſideration at preſent were certainly imported into Greece from the Eaſt. In thoſe regions, then, we ought of courſe to look for the etymology of the word. *Miſtor* or *miſtur*, in Hebrew, ſignifies "any place or thing hidden or concealed." As this word implies a kind of definition of the nature of the thing intended, and as it is one of the excellencies of original languages to apply vocables with this propriety, we find ourſelves ſtrongly inclined to aſſign the word *myſtur* as the root of the term Μυϛηρ, *myſter*.

4 Motives to the introduction of the myſteries. We have already obſerved, that the avarice and ambition of the pagan prieſthood probably gave birth to the inſtitution of the myſteries. To this obſervation we may now add, that the miniſters of that ſuperſtition might poſſibly imagine, that ſome articles of the ritual were too profound to be comprehended by the vulgar; others, too ſacred to be communicated to a deſcription of men whom the inſtitutions of civil ſociety had placed in a ſituation not only ſubordinate but even contemptible. It was imagined, that things ſacred and venerable would have contracted a taint and pollution by an intercourſe with ſordid and untutored ſouls. Theſe appear to us the moſt probable motives for making that odious and pernicious diſtinction between the popular religion and that contained in the ſacred and myſterious ritual.

The learned Biſhop Warburton is poſitive, that the myſteries of the Pagan religion were the invention of legiſlators † and other great perſonages, whom fortune or their own merit had placed at the head of thoſe civil ſocieties which were formed in the earlieſt ages in different parts of the world. 5 The hypotheſis of Warburton ill founded. It is with reluctance, and indeed with diffidence, that we preſume to differ in our ſentiments from ſuch reſpectable authority. Whatever hypotheſis this prelate had once adopted, ſo extenſive was his reading, and ſo exuberant his intellectual reſources, that he found little difficulty in defending it by an appearance of plauſibility, if not of rational argumentation. The large quotations he has adduced from Plato and Cicero, do indeed prove that the ſages and legiſlators of antiquity ſometimes availed themſelves of the influence derived from the doctrines of the myſteries, and from the authority they acquired by the opinion of their having been initiated in them; but that thoſe men were the inventors and fabricators of them, is a poſition for which his quotations do not furniſh the moſt ſlender preſumption. At the ſame time, we think it not altogether certain, that the doctrine of a divine providence, and a future ſtate of rewards and puniſhments, were revealed in the myſteries with all the clearneſs and cogency which is pretended by his Lordſhip.

But granting that the fabric was raiſed by the hands of ſages and legiſlators, we imagine it would be rather difficult to diſcover what emolument that deſcription of men could propoſe to derive from the enterpriſe.—The inſtitution was evidently, and indeed confeſſedly, deviſed to conceal from the million thoſe very doctrines and maxims, which, had they known and embraced them, would have contributed moſt effectually to diſpoſe them to ſubmit to thoſe wiſe regulations which their governors and legiſlators wiſhed moſt ardently to eſtabliſh. Experience has taught, that nothing has a mere commanding influence on the minds of the vulgar, than thoſe very dogmas, which, according to the Biſhop, were communicated to the initiated. A conviction of the Unity of the Deity, of his wiſdom, power, goodneſs, omnipreſence, &c. the ſteady belief of the immorality of the human ſoul, and of a future ſtate of rewards and puniſhments, have in all ages, and in all countries, proved the firmeſt ſupports of legal authority. The very ſame doctrines, in the dawn of chriſtianity, contributed of all other methods the moſt effectually to tame and civilize the ſavage

† Divine Leg.

ſavage (A) inhabitants of the northern regions of Europe. Suppoſing theſe principles to have been inculcated by the myſteries, the moſt prudent plan legiſlators could have adopted, would have been to publiſh them to all mankind. They ought to have ſent forth apoſtles to preach them to the ſavages whom they had undertaken to civilize. According to the learned prelate, they purſued the oppoſite courſe, and deprived themſelves of thoſe very arms by which they might have encountered and overthrown all the armies of ſavagiſm.

6 Myſteries of Eleuſis ſaid to be revealed publicly in Crete.

Of all the legiſlators of antiquity, the Cretan alone was prudent enough to ſee and adopt this rational plan. Diodorus the Sicilian informs us*, that the myſteries of Eleuſis, Samothracia, &c. which were elſewhere buried in profound darkneſs, were among the Cretans taught publicly, and communicated to all the world. Minos, however, was a ſucceſsful legiſlator; and his intercourſe with Jupiter Idæus extended his influence and eſtabliſhed his authority. He was not under the neceſſity of calling in the myſteries to his aſſiſtance: on the contrary, it is highly probable that the univerſal knowledge of the doctrines of the myſteries among his countrymen contributed in a conſiderable degree to facilitate his labour, and enſure his ſucceſs.

* Lib. 5.

The divine Author of the Chriſtian œconomy, viewed in the light of a human legiſlator, ſaw the propriety of this procedure. Nothing was concealed in his inſtitutions; nothing was veiled with myſtery, or buried in darkneſs. The ſucceſs was anſwerable to the wiſdom of the plan. The million flocked to the evangelical ſtandard: the goſpel was preached to the poor, to the illiterate and the vulgar; and the meaneſt of mankind eagerly embraced its maxims. Wherever it prevailed, it produced civilization, morality, ſobriety, loyalty, and every other private and ſocial virtue.— Upon the ſuppoſition that the myſteries had contained and inculcated the principles and practices which the prelate ſuppoſes they did, the civilizers of mankind, legiſlators, magiſtrates, and princes, ought to have combined to make them public for the ſake of their own tranquillity, and the more effectual ſupport of their authority and influence.

7 Myſteries the offſpring of Egyptian prieſtcraft; but

Upon the whole, we are inclined to believe that the myſteries were the offſpring of Egyptian prieſtcraft. They were inſtituted with a view to aggrandiſe that order of men, to extend their influence, and enlarge their revenues. To accompliſh thoſe ſelfiſh projects, they applied every engine towards beſotting the multitude with ſuperſtition and enthuſiaſm. They taught them to believe, that themſelves were the diſtinguiſhed favourites of heaven; and that celeſtial doctrines had been revealed to them, too holy to be communicated to the profane rabble, and too ſublime to be comprehended by vulgar capacities. It is, we confeſs, exceedingly probable, that after the myſteries were inſtituted, and had acquired an exalted reputation in the world, legiſlators, magiſtrates, judges, and potentates, joined in the impoſture, with the ſame views and from the ſame principles. Princes and legiſlators, who found their advantage in overawing and humbling the multitude, readily adopted a plan which they found ſo artfully fabricated to anſwer thoſe very purpoſes. They had intereſt enough with the ſacerdotal (B) myſtagogues, to induce them to allow them to participate in thoſe venerable rites which had already eſtabliſhed the authority of that deſcription of men in whoſe hands they were depoſited. The views of both parties were exactly congenial. The reſpect, the admiration, and dependence of the million, were the ultimate objects of their ambition reſpectively.— Prieſts and princes were actuated by the very ſame ſpirit. The combination was advantageous, and of conſequence harmonious. For theſe reaſons we have taken the liberty of differing from his lordſhip of Glouceſter with reſpect to the perſons who firſt inſtituted the ſecret myſteries of the Pagan religion.

8 adopted by legiſlators, &c.

9 Hypotheſis of Moſheim.

Another writer, of conſiderable reputation in the republic of letters, is of opinion, that the myſteries were entirely commemorative; that they were inſtituted with a view to preſerve the remembrance of heroes and great men, who had been deified in conſideration of their martial exploits, uſeful inventions, public virtues, and eſpecially in conſequence of the benefits by them conferred on their contemporaries.— According to him, the (C) myſteries of Mithras were eſtabliſhed for this very purpoſe. It would be no difficult matter to prove that the Perſian deity of that name was the ſun, and that his name and inſignia jointly aſcertain the truth of this aſſertion. The ſame writer extends this obſervation to the myſteries of the Egyptians, Phœnicians, Greeks, Hetruſcans; and in a word, to all the inſtitutions of that ſpecies throughout the world. In oppoſition to this ſingular opinion, it may be argued, we think with ſome ſhew of reaſon, that the method of preſerving the memory of great and illuſtrious men generally adopted, was the eſtabliſhing feſtivals, celebrating games, offering ſacrifices, ſinging hymns, dances, &c. We can recollect no ſecret myſteries inſtituted for that purpoſe at leaſt in their original intention. If any uſage of the commemorative kind was admitted, it was ſuperinduced at ſome period poſterior to the primary inſtitution. At the ſame time, upon the ſuppoſition that the orgia of Bacchus were the ſame with thoſe of the Egyptian Oſiris, and that the myſteries of Ceres exhibited at Eleuſis were copied from thoſe of the Egyptian Iſis, and allowing that the former was the ſun, and the latter the moon; it will be difficult to find out the human perſons whoſe exploits, adventures,

10 ſingular and indefenſible.

(A) The Germans, Ruſſians, and Scandinavians, who were never thoroughly civilized till the goſpel was preached among them.

(B) The myſtagogues were the miniſters who acted the chief part in celebrating the myſteries.

(C) Principio hoc ego quidem controverſia vacare, arbitror, myſteria quæ vocantur ritus fuiſſe idcirco inſtitutos ne memoria periret veterum beneficiorum, inventorum, factorum rerum geſtarum quibus primi populorum conditores, aut alii præclari homines, decus nomen, et famam, inter ſuos ſibi comparaverant. Neque hæc cuiquam ſententia mirabilis videri poterit. *Cud. Syſt. Intell. ed Moſhemi*, p. 329.

inventions, &c. were intended to be immortalized by thoſe inſtitutions. Upon the whole, the myſteries were performed in ſecret; they were intended to be communicated only to a few: of courſe, had they been inſtituted with a view to immortalize the memory of heroes and great men, the authors would have acted the moſt fooliſh and inconſiſtent part imaginable.—Inſtead of tranſmitting the fame of their heroes with eclat to poſterity, they would by this procedure have conſigned it to eternal oblivion.

11
Our firſt poſition ſupported by the character of the prieſts of Egypt.

We muſt then recur to our firſt poſition. The myſteries were the offspring of bigotry and prieſtcraft; they originated in Egypt, the native land of idolatry. In that country the prieſthood ruled predominant. The kings were ingrafted into their body before they could aſcend the throne. They were poſſeſſed of a third part * of all the land of Egypt. The ſacerdotal function was confined to one tribe, and was tranſmitted unalienably from father to ſon. All the orientals, but more eſpecially the Egyptians, delighted in myſterious and allegorical doctrines. Every maxim of morality, every tenet of theology, every dogma of philoſophy, was wrapt up in a veil of allegory and myſticiſm. This propenſity, no doubt, conſpired with ambition and avarice to diſpoſe them to a dark and myſterious ſyſtem of religion. Beſides, the Egyptians were a gloomy † race of men; they delighted in darkneſs and ſolitude. Their ſacred rites were generally celebrated with melancholy airs, weeping, and lamentation. This gloomy and unſocial bias of mind muſt have ſtimulated them to a congenial mode of worſhip. In Egypt then we are to ſearch for the origin of the myſteries. Both the nature of the inſtitution and the genius of the people confirm this poſition; and hiſtorians, both ancient and modern, are agreed in admitting the certainty of the fact.

* Diodor. Sicul. Lib. I.

† Plutarch.

12
The Oſiris the Iſis of Egypt the Bacchus and Ceres of Greece.

The Oſiris of Egypt, every body knows, was the original Bacchus; as the Iſis of the ſame country was the Ceres of the Greeks. The rites of Oſiris were performed with loud ſhrieks and lamentations when he was put into the coffin; and with the moſt extravagant mirth, when he was in a manner raiſed from the dead, or ſuppoſed to be found again. Their hymns were upon the whole always compoſed in melancholy affecting ſtrains; and conſiſted of lamentations for the loſs of Oſiris, the myſtic flight of Bacchus, the wandering of Iſis, and the ſufferings † of the gods. The Canaanites, who were a kindred tribe of the Mizraim or Egyptians, imitated them in their ſacred rites. At Byblus, Berytus, Sidon, and afterwards at Tyre, they uſed particularly mournful dirges for the death of Adonis or Tammuz †, who was the ſame with the Egyptian Oſiris, *i. e.* the ſun.

† Plut. Iſ. et Oſir.

† Ezek. Chap 8. and Nonni Dionyſ.

13
Death of Oriſis and wanderings of Iſis.

The Egyptians, then, naturally inclined to gloom and ſecrecy, inſtituted a mode of worſhip congenial with their natural diſpoſition of mind. The receſs of the ſun towards the ſouthern hemiſphere, was the death † of Oriſis; the wanderings of Iſis in ſearch of her huſband and brother, allegorically imported the longings of the earth * for the return of the fructifying influence of the ſolar heat.

† Macrob. Saturn.

* Plut. Iſ. et Oſir.

When that luminary returned towards the ſummer ſolſtice, and grain, trees, fruits, herbs, and flowers adorned the face of nature, another feſtival was celebrated of a very different complexion from that of the former. In this ſeaſon all Egypt was diſſolved in the moſt extravagant mirth and jollity. During the celebration of thoſe feſtivals, the prieſts formed allegorical repreſentations of the ſun and the earth (D). They perſonified the one and the other, and allegorized their motions, aſpects, relations, ſympathies, acceſſes, receſſes, &c. into real adventures, peregrinations, ſufferings, conteſts, battles, victories, defeats, and ſo forth. Theſe, in proceſs of time, were held up to the vulgar as real occurrences; and theſe in a few ages became the moſt eſſential articles of the popular creed. From this ſource were derived the conqueſts of Dionyſius or Bacchus, ſo beautifully exhibited by Nonnus in his Dionyſiacs; the wanderings of Io, wonderfully adorned by Æſchylus; and the labours of Hercules, afterwards uſurped by the Greeks.

14
The Egyptians deified departed heroes.

Whether the Egyptians deified mortal men in the earlieſt ages has been much controverted. Jablonſki * has taken much pains to prove the negative. Diodorus ‡ aſſures us that they paid their monarchs a kind of divine adoration, even in their lifetime. Plutarch tells us plainly § that ſome were of opinion that Iſis, Oſiris, Horus, Anubis, Typhon, were once mortal perſons, who were exalted into dæmons after their death. The Sicilian, in his hiſtory of Iſis and Oſiris, Pan, Hermes, &c. plainly repreſents them as human perſonages; and informs us, that the Egyptians imagined, that after their deceaſe they tranſmigrated into particular ſtars. From theſe authorities, we are inclined to believe that the Egyptians, as well as the other pagans, did actually deify perſons who had diſtinguiſhed themſelves in their days of nature by proweſs, wiſdom, uſeful arts, and inventions. This was a conſtant practice among the Greeks, who probably learned it from the people in queſtion.

* Panth. Egypt.

‡ Lib. i.

§ Iſ. et Oſir.

15
Secrets reſpecting the objects of worſhip revealed in the myſteries.

The exploits of theſe heroes had been diſguiſed by allegorical traditions and hieroglyphical repreſentations. They had been magnified beyond all dimenſions, in order to aſtoniſh and intimidate the vulgar. They had been interlarded with the moſt extravagant fables, in order to gratify their propenſity towards the marvellous. All theſe ſecrets were developed in the myſteries. The catechumens (E) were informed of every particular relating to the birth, the life, the exploits, the adventures, the misfortunes, and deceaſe of thoſe heroic perſonages, and when, and by what means, they had attained to the high rank of divinities. At the ſame time we think it highly probable, that thoſe demigods were repreſented in their ſtate of exaltation and heavenly ſplendour. The magicians of Egypt were abundantly qualified for exhibiting *angels in machines*. The ſouls of virtuous men, who had not been eminent enough to merit the honour of deification, were ſhown in all the perfection of Elyſian felicity; and perhaps the

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(D) Iſis, among the Egyptians, ſometimes ſignified the moon, and ſometimes the earth.

(E) Catechumens were pupils who were learning the elements of any ſcience.

the ſouls of tyrants, and of the children of (F) Typhon, were ſhown in Tartarus, ſuffering all the extremes of infernal puniſhment. From theſe exhibitions the myſtagogues might naturally enough take occaſion to read their pupils ſuitable lectures on the happy tendency of a virtuous conduct, and the diſhonour and miſery conſequent upon a contrary courſe. They might ſet before them immortal renown, deification, and elyſium, on the one hand, and eternal infamy and miſery on the other. This will probably be deemed the chief advantage accruing from this inſtitution.

16
Chief advantage of the myſteries.

Beſides the communications above-mentioned, the catechumens were taught many ſecrets of phyſiology, of the nature of the phenomena of the world. This Pharnutus* every where affirms, eſpecially in his laſt book towards the end. Plutarch too informs us, that many of the Greek philoſophers were of opinion, that moſt of the Egyptian fables were allegorical details of phyſical operations. Euſebius acquaints us §, that the phyſiology, not only of the Greeks, but likewiſe of the barbarians, was nothing elſe but a kind of ſcience of nature, a concealed and dark theology, involved in fable and fiction, whoſe hidden myſteries were ſo veiled over with enigmas and allegories, that the ignorant million were as little capable of comprehending what was ſaid as what was ſuppreſſed in ſilence. This, ſays he, is apparent from the poems of Orpheus and the fables of the Phrygians and Egyptians. Dionyſius of Halicarnaſſus likewiſe obſerves ‡, that the fables of the Greeks detail the operations of nature by allegories. Proclus § makes the ſame obſervation concerning the people in queſtion. The Egyptians, ſays he, taught the latent operations of nature by fables.

* De Nat. Deorum

§ Prop. Evangel.

‡ Antiq. Rom.

§ in Tim.

87
Phyſiological ſecrets expounded in the myſteries of Egypt.

Theſe phyſiological ſecrets were no doubt expounded to the initiated; and that the Egyptian prieſts were deeply ſkilled in phyſiological ſcience, can ſcarce be queſtioned, if we believe that Jannes and Jambres rivalled Moſes with their enchantments. The preceding detail comprehends all that was revealed to the Epoptæ in the original Egyptian myſteries. What articles might have been introduced afterwards we cannot pretend to determine.

Be that as it may, one thing is certain, namely that the vulgar were excluded from all thoſe choice ſecrets, which were carefully reſerved for the nobility and ſacerdotal tribes. To them it was given to know the myſteries of the kingdom of darkneſs; but to thoſe who were without, all was myſtery and parable. While the laity fed on huſks, the clergy and quality feaſted on royal dainties. The prieſts who had deviſed theſe allegories underſtood their original import, and bequeathed it as an ineſtimable legacy to their children. Here then we have the primary object of the myſteries, namely, to develope to the initiated the original and rational import of thoſe allegorical and myſtical doctrines which were tendered to the uninitiated, wrapt up in impenetrable allegory and obſcurity. To the former, theſe were communicated and explained: The latter were obliged to ſtand at an awful diſtance, and retire as the *Procul, O procul eſte profani*, thundered in their ears.

Theſe allegorical traditions originated in Egypt, (ſee MYTHOLOGY). It was the general bias of the oriental genius. The Egyptians, however according to the moſt authentic accounts (G), were the greateſt proficients in that ſcience. The original ſubject of theſe inſtitutions were, we imagine, the articles we have ſpecified above: but in proceſs of time, according to the natural courſe of things, numerous improvements were made, and many new rites, ceremonies, uſages, and even doctrines were ſuperinduced, which were utterly unknown to the original hierophants (H). Simplicity is for the moſt part one of the diſtinguiſhing characters of a new inſtitution; but ſucceeding architects generally imagine that ſomething is ſtill wanting to complete the beauty, the regularity, the uniformity, the magnificence, and perhaps the conveniency of the ſtructure. Hence, at length, it comes to be ſo overloaded with adventitious drapery, that its primary elegance and ſymmetry is altogether defaced. This was the caſe with the earlieſt Egyptian myſteries. Their ſubject was at firſt ſimple and eaſy to be comprehended; in time it became complex, intricate, and unintelligible.

18
Temples where the myſteries were celebrated.

In order to celebrate thoſe myſteries with the greater ſecrecy, their temples were ſo conſtructed as to favour the artifice of the prieſts. The fanes, in which they uſed to execute their ſacred functions, and to perform the rites and ceremonies of their religion, were ſubterraneous apartments, conſtructed with ſuch wonderful ſkill and dexterity, that every thing that appeared in them breathed an air of ſolemn ſecrecy. Their walls were covered with hieroglyphic paintings and ſculpture, and the altar was ſituated in the centre of the apartment. Modern* travellers have of late years diſcovered ſome veſtiges of them, and bear witneſs to the above deſcription of thoſe dark abodes (I). In thoſe ſubterraneous manſions, which the prieſts of that ingenious nation had planned with the moſt conſummate ſkill, the kings, princes, and great men of the ſtate, encountered the dangers and hardſhips contrived to prove their prudence, fortitude, patience abſtinence &c. Theſe were appointed to try their merit; and by theſe the hierophants were enabled to decide whether or not they were duly qualified for receiving that benefit. Upon thoſe occaſions we may believe, abundance of thoſe magical tricks were exhibited, for which the magicians of Egypt were ſo much celebrated among the ancients. The ſtrange and aſtoniſhing ſights, the alternate ſucceſſions of light and darkneſs, the hideous ſpectres expoſed to view, the frightful howlings reechoed by theſe infernal domes, the ſcenes of Tartarus and

* Norden, Shaw, Pococke, &c.

(F) Typhon was the evil genius, or devil of the Egyptians.

(G) As early as the age of Joſeph, the Egyptians were ſkilled in the interpetations of dreams, divinations, &c. and in the age of Moſes they were become wiſe men, magicians, &c.

(H) Hierophant imports a prieſt employed in explaining the doctrines, rites, &c. communicated to the initiated.

(I) See an excellent deſcription of theſe ſubterraneous abodes, and of the proceſs of probation carried on there, in a French romance, intitled *The life of Sethos* and Elyſium, exhibited alternately and in quick ſucceſſion, muſt have made a deep and laſting impreſſion on the mind of the affrighted votary (K). Theſe ſcenes we ſhall deſcribe more fully in the ſequel.

19
The Grecian infernal regions copied from the Egyptian myſteries.

From the ſcenes exhibited in celebrating the Egyptian myſteries, eſpecially thoſe of Iſis and Oſiris, the Greeks ſeem to have copied their ideas of the infernal regions, and the ſubterraneous manſions of departed ſouls. Many colonies of Egyptians ſettled in Greece. From theſe the ἀοιδοὶ (L), or moſt early bards of Greece, learned them imperfectly. Of courſe, we find Homer's account of the infernal regions, and of the ſtate of departed ſouls, lame and incoherent. Succeeding bards obtained more full and more diſtinct information. Euripides and Ariſtophanes ſeem to have paved the way for the prince of Roman poets. Plato* and ſome of the other philoſophers have ſhown by their deſcriptions or alluſions, that the whole apparatus of Tartarus and elyſium had become a hackneyed topic ſome centuries before Virgil was born. This incomparable poet borrowed his ideas from Homer, Ariſtophanes, Euripides, Plato, &c. Theſe, under his plaſtic hand, in the ſixth Æneid, grew into a ſyſtem beautiful, regular, uniform, and conſiſtent. The materials he has employed were created to his hand; he had only to collect, poliſh, arrange, and connect them.—The ſentiments collected from the Platonic philoſophy, and the inimitable epiſode copied from the annals of Rome, by the maſterly ſkill which he has diſplayed in the application of them, form the chief excellencies of the piece. For the reſt, he could well diſpenſe with going to Eleuſis (M): every old women in Athens and Rome could repeat them.

* Phædo.

20
Myſteries brought from Egypt into Perſia and Greece

Egypt was then the native land of myſteries as well as of idolatry. Every god and goddeſs reſpectively had their myſteries: but as thoſe of Iſis and Oſiris were the moſt celebrated, they of courſe became principal objects of purſuit as well as of imitation to the neighbouring nations. Theſe, as is generally believed, were carried into Perſia by Zoroaſtres, or Zerduſht, by whom they were conſecrated to Mithras. On theſe we ſhall make ſome obſervations on the ſequel.—Orpheus imported them into Thrace: Cadmus brought them into Bœotia, where they were ſacred to Bacchus. Inachus eſtabliſhed them at Argos in honour of Juno, the ſame with Iſis (N); Cyniras in Cyprus, where they were dedicated to Venus. In Phrygia they were ſacred to Cybele, the mother of the gods,

Our learned readers, who will probably reflect that the Egyptians were in ancient times inhoſpitable to ſtrangers, will perhaps be ſurpriſed that this faſtidious and jealous people were ſo ready to communicate the arcana of their religion to foreigners.—But they will pleaſe to recollect, that a great part of Greece was planted with colonies from Egypt, Phœnicia, Paleſtine, &c. This we could eaſily prove, did the bounds preſcribed us admit ſuch a digreſſion. Orpheus, if not an Egyptian, was at leaſt of oriental extraction. Inachus, Cadmus, and Melampus, are univerſally allowed to have been Egyptians. Frechtheus, in whoſe reign the Eleuſinian myſteries were eſtabliſhed, was an Egyptian by birth, or at leaſt ſprung from Egyptian anceſtors. The Egyptians, then, in thoſe early ages, did not view the Greeks in the light of aliens, but as a people nearly related either to themſelves or the Phœnicians, who were their brethern. Upon this connection we imagine it was, that in later times moſt of the ſages of Greece, aſpecially of Athens, found ſo hoſpitable a reception among that people. They probably viewed them in the light of propagandi; apoſtles able and willing to diſſeminate their idolatrous rites. This obſervation, which might be ſupported by numberleſs authorities, did the nature of the preſent inquiry permit, will, we think, go a great way towards obviating the objection.

21
Myſteries of Mithras, Bacchus, and Ceres, the moſt auguſt.

Although, as has been obſerved, every particular deity had his own peculiar myſterious ſacred rites, yet of all others thoſe of Mithras, Bacchus (O), and Ceres, were deemed the moſt auguſt, and were moſt univerſally and moſt religiouſly celebrated. To theſe, therefore, we ſhall in a good meaſure confine ourſelves upon this occaſion. If our readers ſhall become intimately acquainted with theſe, they may readily diſpenſe with the knowledge of the reſt, which are, indeed, no more than ſtreams and emanations from theſe ſources. We ſhall then, in the firſt place, preſent to our readers a brief ſketch of the myſteries of Mithras.

MITHRAS, or according to the Perſian, *Mihr*, was one of the great gods of the Aſiatics. His worſhip was for many ages confined to Perſia. Afterwards, however, it was propagated ſo far and wide that ſome have imagined they had diſcovered veſtiges of it even in Gaul. *Mihr*, according to Dr Hyde*, ſignifies love, and likewiſe the *Sun*. If we might preſume to differ from ſo reſpectable an authority, we ſhould conjecture that it is a cognate of the Hebrew word *Muhir*, "excellentia, preſtantia," That there was an analogy between the Hebrew and old Perſian, is generally admitted by the learned. Be that as it may, Mithras was the ſun (P) among the Perſians; and in honour of

* Relig. vet. Perſarum.

(K) Perſons who had deſcended into Trophonius's vault were ſaid to have been ſo terrified with ſhocking ſights, that they never laughed during the remainder of their lives.

(L) Theſe were ſtrolling poets like our minſtrels; who frequented the houſes of the great men of Greece, and entertained the company upon public occaſions with ſinging and tales of other times.

(M) Biſhop Warburton has, with much ingenuity, and a vaſt profuſion of reading, endeavoured to prove that Virgil borrowed the whole ſcenery of the ſixth Æneid from the ſources mentioned in the text.

(N) Iſis was the moon, and the original Juno was the ſame planet.

(O) Bacchus was the Oſiris of the Egyptians, and Ceres was the Iſis of the ſame people.

(P) Moſheim, in his notes on Cudworth's Intellectual Syſtem, page 330, has taken much pains to prove that Mithras was a deified mortal; but we cannot agree with that learned man in this point.

22 Account of the myſteries of Mithras.

of that luminary this inſtitution was eſtabliſhed. Mithras, according to Plutarch (Q), was the middle god between Oramaz and Ariman, the two ſupreme divinities of Perſia. But the fact is, the ſolar planet was the viſible emblem of Oramaz, the good genius of the Perſian tribes, and the ſame with the Oſiris of the Egyptians. From theſe people, ſome have imagined that Zoroaſtres (R), or Zerduſht, burrowed his myſteries of Mithras. To this opinion we cannot give our aſſent, becauſe the probationary trials to be under gone by the candidates among the former were much more ſavage and ſanguinary than among the latter.—Both, however, were inſtituted in honour of the ſame deity, and probably the ſcenes exhibited, and the information communicated in both were analogous; a circumſtance which perhaps gave birth to the opinion abovementioned.

The grand feſtival of Mithras was celebrated ſix days, in the middle of the month Mihr (S). Upon theſe days, it was lawful for the kings of Perſia to get drunk and dance. On this feſtival we imagine, the candidates for initiation, having duly proved their vocation, were ſolemnly admitted to the paticipation of the myſteries.

Zoroaſtres (T) worſhipped Mithras, or the Sun, in a certain natural cave, which he formed into a temple, and filled up in a manner exactly mathematical. There Mithras was repreſented as preſiding over the lower world with all the pomp of royal magnificence. In it too were ſeen the ſymbols of Mithras and of the word, philoſophically and mathematically exhibited, to be contemplated and worſhipped. This deity was ſometimes repreſented as mounted on a bull, which he is breaking, and which he kills with a ſword. On ſome bas reliefs ſtill exiſting, he appears as a young man with his tiara turned upward, after the manner of the Perſian kings. He is clothed with a ſhort tunic and breeches, after the Perſian faſhion. Sometimes he wears a ſmall cloke. By his ſides are ſeen other human figures, with tiaras of the ſame faſhion on their heads, but without clokes. One of theſe figures commonly holds in his one hand a torch lifted up; in the other one turned downward. Sometimes over the cave is ſeen the chariots of the ſun and moon, and divers conſtellations, ſuch as cancer, ſcorpion, &c.

23 Probationary exerciſes previous to initiation.

In one of thoſe caves the ceremonies of initiation were performed; but before the candidate could be admitted, he was forced to undergo a courſe of probationary exerciſes, ſo numerous and ſo rigorous that very few had courage and fortitude enough to go thro' them. He was obliged to live a life of virtue and abſtinence for a ſpace of ſeven years previous to the period of his initiation. Some months before it he was obliged to ſubmit to a long and auſtere faſt, which continued fifty days. He was to retire ſeveral days to a deep and dark dungeon, where he was ſucceſſively expoſed to all the extremes of heat and cold. Meantime he frequently underwent the baſtinado, which the prieſts applied without mercy. Some ſay this fuſtigation continued two whole days, and was repeated no leſs than 15 times. In the courſe of theſe probationary exerciſes, the candidate was generally reduced to a ſkeleton; and we are told, that there have been ſeveral inſtances of perſons who have periſhed in the attempt.

Upon the eve of the initiation, the aſpirant was obliged to * brace on his armour, in order to encounter giants and ſavage monſters. In thoſe ſpacious ſubterraneous manſions a mock hunting was exhibited. The prieſts and all the ſubordinate officers of the temple, transformed into lions, tigers, leopards, boars, wolves, and other ſavage creatures, aſſailed him with loud howlings, roaring, and yelling, and every inſtance of ferine fury. In thoſe mock combats, the hero was often in danger of being really worried, and always came off with bruiſes and wounds. Lampridius informs us, that when the emperor Commodus was initiated, he actually carried the joke too far, and butchered one of the prieſts who attacked him in the figure of a wild beaſt. The Perſians worſhipped Mithras or the Sun by a perpetual fire: hence the votary was obliged to undergo a fiery trial; that is, to paſs ſeven times through the ſacred fire, and each time to plunge himſelf into cold water. Some have made theſe probationary penances amount to 80; others have thought that they were in all only 8. As we find no good authority for either of theſe numbers, we think ourſelves at liberty to hazard the following conjecture: The number *ſeven* was deemed ſacred over all the eaſt. The Mythriac penances we imagine were either ſeven, or if they exceeded it, were regulated by ſeven repetitions of that number. The candidate having undergone all theſe torturing trials with becoming patience and fortitude, was declared a proper ſubject for initiation. But before his admiſſion he was obliged to bind himſelf by the moſt ſolemn oath, with horrible imprecations annexed, never to divulge any ſingle article of all that ſhould be communicated to him in the courſe of his initiation.

* Jul. Firmicus.

24 Oath of ſecrecy.

25 Revelations in the myſteries of Mithras.

What ἀπόῤῥητα or *ineffable ſecrets* were imparted to the initiated, it is impoſſible at this diſtance of time to diſcover with any tolerable degree of certainty. We may, however, reſt aſſured that the moſt authentic tradition concerning the origin of the univerſe; the nature, attributes, perfections, and operations, of Oromaſd: the baleful influences of Ariman; and the benign

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(Q) Iſis and Oſiris, page 369. l. 20, from the bottom. This philoſopher makes Zoroaſter, according to ſome, 5000 years prior to the Trojan war. This date is certainly extravagant. We cannot, however, agree with ſome moderns, who make him contemporary with Darius Hyſtaſpes, the immediate ſucceſſor of Cambyſes, becauſe it contradicts all antiquity.

(R) M. Silohwette, Diſſer. V. page 17. aſſerts that Zoroaſtres was initiated among the Egyptians.

(S) The month Mihr began September 30, and ended October 30.

(T) See Dr Hyde de Rel vet. Perſ. page 16, 17. Mr Bryant's Anal. vol. i. page 232. Porphyr. de antro Nymph, page 254. This philoſopher often mentions the cave of Mithras, and always attributes the inſtitution of his rites to Zoroaſter.

nign effects of the government of Mithras, were unfolded and inculcated. The ſecret phenomena of nature, as far as they had been diſcovered by the magi, were likewiſe exhibited; and the application of their effects, to aſtoniſh and delude the vulgar, were taught both in theory and practice. The exerciſe of public and private virtues was warmly recommended; and vice repreſented in the moſt odious and frightful colours. Both theſe injunctions were, we may ſuppoſe, enforced by a diſplay of the pleaſures of Elyſium and the pains of Tartarus, as has been obſerved above in deſcribing the myſteries of the Egyptians.

* Dial. cum Tryphone
† De Præſcript. adver. Hæret.

Thoſe initiations are mentioned by Lampridius in the life of Commodus, and likewiſe by Juſtin * and Tertullian †, who both flouriſhed in the ſecond century. The laſt of theſe two ſpeaks of a kind of baptiſm, which waſhed from the ſouls of the initiated all the ſtains which they had contracted during the courſe of their lives prior to their initiation. He at the ſame time mentions a particular mark which was imprinted upon them (U), of an offering of bread, and an emblem of the reſurrection: which particulars, however, he does not deſcribe in detail. In that offering, which was accompanied with a certain form of prayer, a veſſel of water was offered up with the bread. The ſame father elſewhere informs us, that there was preſented to the initiated a crown ſuſpended on the point of a ſword; but that they were taught to ſay, *Mithras is my crown*. By this anſwer was intimated, that they looked upon the ſervice of that deity as their chief honour and ornament.

After that the Teletæ (X) were finiſhed, the pupil was brought out of the cave or temple, and with great ſolemnity proclaimed a lion of Mithras (Y); a title which imported ſtrength and intrepid courage in the ſervice of the deity. They were now conſecrated to the god, and were ſuppoſed to be under his immediate protection; an idea which of courſe animated them to the moſt daring and dangerous enterpriſes.

The worſhip of Mithras was introduced into the Roman empire towards the end of the republic, where it made very rapid progreſs. When Chriſtianity began to make a figure in the empire, the champions for paganiſm thought of propoſing to men the worſhip of this *power of benevolence*, in order to counterbalance or annihilate that worſhip which the Chriſtians paid to Jeſus Chriſt the true *Sun* of righteouſneſs. But this mode was ſoon aboliſhed, together with the other rites of paganiſm. The Perſian grandees often affected names compounded with Mithras; hence Mithridates, Mithrobarzanes, &c.: Hence too, the precious ſtone called *Mithridat* *, which by the reflection of the ſun ſparkled with a variety of colours. There is likewiſe a certain pearl of many different colours, which they call *Mithras*. It is found among the mountains near the Red Sea; and when expoſed to the ſun, it ſparkles with a variety of dyes. We find likewiſe a king of Egypt of that name who reigned at Heliopolis; who being commanded in a dream to erect an obeliſk to the ſolar deity, reared a moſt prodigious one in the neighbourhood of that city.

* Solinus, cap. 10.

26
Mithras ſaid to have ſprung from a rock.

The votaries of Mithras pretended that he was ſprung from a rock, and that therefore the place where the myſterious ceremonies were communicated to the initiated was always a cave. Many different reaſons have been aſſigned for the origin of this rock-born deity, moſt of which appear to be unſatisfactory. If our readers will be obliging enough to accept of a ſimple and obvious conjecture, they may take the following: A rock is the ſymbol of ſtrength and ſtability (Z): the dominion of Mithras, in the opinion of his votaries, was firm as a rock, and ſtable as the everlaſting hills. If our readers ſhould not admit the probability of this conjecture, we ſhould beg leave to remit them to the learned Mr Bryant's *Analyſis of Mythology*, where they will find this point diſcuſſed with deep reſearch and wonderful ingenuity. Whatever may have been the origin of this opinion with relation to the birth of Mithras, it is certain that ſome reverence to rocks and caves was kept up a long time even after the eſtabliſhment of Chriſtianity. Hence the prohibition given to ſome of the proſelytes to that religion that they ſhould no more preſume to offer up their prayers *ad petras* at the rocks (A).

We ſhall conclude our account of the myſteries of Mithras with a paſſage from Mr Anquetil, to whom we are ſo much indebted for what knowledge we have of the Perſian theology, and in which the functions of that deity are briefly and comprehenſively delineated. "The peculiar functions of Mithras are to fight continually againſt Abriman and the impure army of evil genii, whoſe conſtant employment is to ſcatter terror and deſolation over the univerſe: to protect the frame of nature from the demons and their productions. For this purpoſe he is furniſhed with a thouſand ears and a thouſand eyes, and traverſes the ſpace between heaven and earth,

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(U) In alluſion to this practice of imprinting a ſacred mark, probably on the forehead of the initiated, we find the injunction to the angel, Ezek. chap. ix. ver. 4. and the Revelation *paſſim*.

(X) The myſteries were called *Teletæ*, which imports, "the rites which confer perfection."

(Y) *Tertull. adv. marc.* p. 55. The prieſts of Mithras were called the *lions of Mithras*, and his prieſteſſes *lionneſſes*; ſome ſay *hyænas*. The other inferior miniſters were called *eagles*, *hawks*, *ravens*, &c. and on their feſtivals they wore maſks correſponding to their titles, after the Egyptian manner, where the prieſts appeared at the ceremonies with maſks reſembling the heads of lions, apes, dogs, &c. a circumſtance which furniſhes a preſumption that the myſteries of Mithras were of Egyptian original.

(Z) Our Saviour probably alludes to this emblem, when he talks of *building his church on a rock*; and adds, *that the gates of hell ſhould not prevail againſt it*.

(A) The Caledonian druids ſeem to have regarded certain ſtones with a ſuperſtitious veneration, in which the Catholics imitated them. There are in ſeveral places of Scotland large ſtones, which the vulgar call *lecre* ſtones, *i. e.* we imagine, *lecture*.

earth his hands armed with a club or mace. Mithras gives to the earth light and ſun; he traces a courſe for the waters; he gives to men corn, paſtures, and children: to the world virtuous kings and warriors; maintains harmony, upon earth, watches over the law, &c." As the hiſtory of Mithras, and the nature of his myſteries, are not generally known, we imagined it would be agreeable to many of our readers to have the moſt important articles relating to that ſubject laid before them as it were in detail.

27 Myſteries of Bacchus. We now proceed to the orgia, or myſteries of Bacchus, which we ſhall introduce with a brief hiſtory of that deity. The original Dionyſus or Bacchus was the Oſiris of the Egyptians, which laſt was the Sun (B). Whether there was an Egyptian monarch of that name, as Diodorus Siculus affirms §, has no manner of connection with the preſent diſquiſition. [§ Lib. i.] The Greek name of that deity is plainly oriental, being compounded of *di*, "bright;" and *nuſia* or *raſa*, in the Æolic dialect *nuſa*, "a prince." [28 Bacchus the ſame with Oſiris.] This name was imported from the eaſt by Orpheus, Cadmus, or by whoever elſe communicated the worſhip of Oſiris to the Greeks. That the Dionyſus of the Greeks was the ſame with the Oſiris of the Egyptians, is univerſally allowed. Herodotus tells us expreſsly †, that *Oſiris* is *Dionyſus* in the Greek language; [† Lib. ii. cap. 144.] Martianus Capellus, quoted above, expreſſes the very ſame idea ‖. [‖ Theol. Egyp. lib. 2. cap 1.] The original Oſiris was the ſun; but the Dionyſus or Bacchus of the Greeks was the ſame with the Oſiris of the Egyptians; therefore the Bacchus or Dionyſus of the Greeks was likewiſe the ſame luminary.

The name *Oſiris* has much embarraſſed critics and etymologiſts. The learned Jablonſki §, [§ Panth. Egyp.] inſtead of delineating the character, attributes, operations, adventures, exploits, and peculiar department aſſigned this deity by his votaries, has ſpent much of his pains on trying to inveſtigate the etymology of his name. If it is granted, which is highly probable, that the Hebrew and Egyptian tongues are cognate dialects, we ſhould imagine that it is actually the *Choſher* or *Oſhir* of the former language, which imports, "to make rich, to become rich." Indeed the words *Oſiris* and *Iſis* were not the vulgar names of the ſun and moon among the Egyptians, but only epithets importing their qualities. The name of the ſun among that people was ***Phri*** or ***Phry***, and that of the moon *Ioh*, whence the Greek *Io*. The term *Oſiris* was applied both to the ſun and to the river Nile; both which by their influence contributed reſpectively to enrich and fertilize the land of Egypt.

It was a general cuſtom among the orientals to denominate their princes and great men from their gods, demigods, heroes, &c. When the former were advanced to divine honours, they were in proceſs of time confounded with their archetypes. The original divinities were forgotten, and theſe upſtart deities uſurped their place and prerogatives. In the earlieſt periods of the Egyptian monarchy, there were two illuſtrious perſonages, Oſiris and Iſis. These were the children of Cronus, and being brother and ſiſter, they were joined in matrimony, according to the cuſtom of the Egyptians. As the brother and huſband had aſſumed the name of the *Sun*, ſo the ſiſter and conſort took that of *Iſis*, that is, "the woman *," a name which the Egyptians applied both to the moon and to the earth, in conſequence of the ſimilarity of their nature, their mutual ſympathy, and congenial fecundity. [* [illegible]] Oſiris having left his conſort Iſis regent of the kingdom with Hermes as her prime miniſter, and Hercules as general of her armies, quitted Egypt with a numerous body of troops, attended by companies of fauns (C), ſatyrs, ſinging women, muſicians, &c. traverſed all Aſia to the eaſtern ocean. He then returned homeward through the Upper Aſia, Thrace, Pontus, Aſia Minor, Syria, and Paleſtine. Wherever he marched he conferred numberleſs benefits on the ſavage inhabitants. He taught the art of cultivating the ground, preſerving the fruits of the earth, and diſtinguiſhing the wholeſome and nutritive from the unwholeſome and poiſonous. He inſtructed them in the culture of the vine, and where vines could not be produced, he communicated to them the method of producing a fermented liquor from barley, very little inferior to wine itſelf. He built many cities in different parts of the globe, planted numerous colonies (D), and wherever he directed his courſe inſtituted juſt and wholeſome laws, and eſtabliſhed the rites and ceremonies of religion, and left prieſts and catechiſts of his train to teach and inculcate the obſervance of them. In ſhort, he left every where laſting monuments of his progreſs, and at the ſame time of his generoſity and beneficence. Where he found the people docile and ſubmiſſive, he treated them with kindneſs and humanity: if any ſhowed themſelves obſtinate, he compelled them to ſubmit to his inſtitutions by force of arms.

At the end of three years, he returned to Egypt, where his brother Typhon, a wicked unnatural monſter, had been forming a conſpiracy againſt his life. [30 His death.] This traiterous deſign he ſoon after accompliſhed in the following manner: He invited Oſiris, with ſome other perſons whom he had gained over, to an entertainment. When the repaſt was finiſhed, he produced a beautiful coffer, highly finiſhed, and adorned with ſtuds of gold; promiſing to beſtow it on the perſon whom it ſhould fit beſt. Oſiris was tempted to make the experiment. The conſpirators nailed down the cover upon him, and threw the coffer into the river. This coffer, which was now become the coffin of Oſiris, was, they tell us, wafted by the winds and waves to the neighbourhood of Byblus, a city of Phœnicia, where it was caſt on ſhore, and left by the waves at the foot of a tamarind tree.

Iſis, in the mean time, diſconſolate and forlorn, at-

(B) See Macrob. lib. i. cap. 21. p. 247. bottom. Diogenes Laert. in proœmio, par. 10 Martian Capel. Lib. 2. Jablonſki, vol. i. lib. ii. p 145. par. 3. Plut. Iſis Oſir. *paſſim*.

(C) Men and women dreſſed in the habits of thoſe rural deities.

(D) Many have thought this expedition fabulous; but the numberleſs monuments of Egyptian architecture, ſculpture, ſtatuary, lately diſcovered in the eaſt, confirm it.

31 Wanderings of Iſis in ſearch of his body. tended by Anubis, was ranſacking every quarter in ſearch of her beloved Oſiris. At length being informed by her faithful attendant and guardian, that his body was lodged ſomewhere in the neighbourhood of Byblus, ſhe repaired to that city. There, they ſay, ſhe was introduced to the queen, and after (E) a variety of adventures ſhe recovered the corpſe of her huſband, which, of courſe, ſhe carried back with her to Egypt; but the miſchievous Typhon, ever on the watch, found her on the banks of the Nile; and having robbed her of her charge, cut the body into 14 parts, and ſcattered them up and down. Now, once more, according to the fable, Iſis ſet out in queſt of thoſe parts, all of which, only one excepted, ſhe found and interred in the place where ſhe found them: and hence the many tombs of Oſiris in that country. Theſe tombs were denominated *tapoſins* by the natives. Many other fabulous adventures, were aſcribed to thoſe two perſonages, which it is not our province to enumerate at preſent. If our readers ſhould wiſh to be more minutely informed on this ſubject, they may have recourſe to the authors mentioned in the laſt quoted author, or to the learned Mr Bryant's Analyſis of Ancient Mythology, and M. Cour de Gebelin, where they will find matter enough to gratify their curioſity.

32 The myſteries of Iſis and Oſiris inſtituted in commemoration of thoſe adventures. To commemorate thoſe adventures, the myſteries of Iſis and Oſiris were inſtituted; and from them both thoſe of Bacchus and Ceres, among the Greeks were derived. Of the Egyptian ſolemnity, we have an exact epitome in one of the fathers of the church to the following purpoſe; "Here follows (ſays he) an epitome of the myſteries of Iſis and Oſiris. They deplore annually, with deep lamentations and ſhaved heads, the cataſtrophe of Oſiris over a buried ſtatue of that monarch. They beat their breaſts, mangle their arms, tear open the ſcars of their former wounds; that by annual lamentations the cataſtrophe of his miſerable and fatal death may be revived in their minds. When they have practiſed theſe things a certain number of days, then they pretend that they have found the remains of his mangled body; and having found them, their ſorrows are lulled aſleep, and they break out into immediate joy." What Maxims of morality, ſecrets of phyſiology, or phenomena of aſtronomy, were couched under this allegorical proceſs, is not our buſineſs to inveſtigate in this place. We ſhall only obſerve, that, in all probabilty, Oſiris and Iſis were ſovereigns of Egypt at a very early period: that they had conferred many ſignal benefits on their ſubjects, who, influenced by a ſenſe of gratitude, paid them divine honours after their deceaſe; that in proceſs of time they were confounded with the ſun and the moon; and that their adventures were at length magnified beyond all credibility, interlarded with fables, and allegories, and employed in the myſteries as channels to convey a variety of inſtructions to the initiated.

33 Transferred to Byblus and Tyre, where Oſiris was called Adonis and Bacchus; Be that as it may, it is certain that the very ſame mode of worſhip was eſtabliſhed at Byblus, and in after ages transferred to Tyre. The Mizraim and Chanaanim were nearly connected by blood, and their religious ceremonies were derived from the very ſame ſource. By what medium the worſhip of Oſiris at Abydus and Tyre was connected, we ſhall leave others to explain; we ſhall only obſerve, that among the Phœnicians this deity obtained the names *Adonis* and *Bacchus*. The former is rather an (F) epithet than a name; the latter is evidently an alluſion to the weeping and lamentation (G) with which the rites were performed. We find another name of that divinity mentioned in Scripture (H), but that term is plainly of Egyptian original; we ſhall now proceed to the myſteries of Oſiris as they were celebrated among the Greeks and Thracians, under the name of the *Orgia* of *Dionyſus* or *Bacchus**.

* Diod. Sicul. Voſſius de Idol.

Orpheus the celebrated Thracian philoſopher had travelled into Egypt in queſt of knowledge: and from that country, according to the moſt authentic accounts, he imported the bacchanalian rites and inſtitutions. Some have affirmed that this ſame Orpheus being intimately acquainted with the family of Cadmus, communicated theſe rites to them, and endeavoured to transfer them to the grandſon of that hero, which grandſon became afterwards the Grecian Bacchus. It is, however, we think, much more probable, that thoſe rites were imported from Egypt or Phœnicia, 34 And thence imported by Cadmus into Bœotia. by (I) Cadmus himſelf, who was a native of the former country, and is thought to have ſpent ſome time in the latter, before he emigrated in queſt of a ſettlement in Bœotia. It is ſaid that Semele, the daughter of Cadmus, and the mother of the Grecian Bacchus, was ſtruck with lightning at the very inſtant of his birth. The child, was in all probability denominated *Bacchus* (K), from the ſorrow and lamentation this melancholy accident had occaſioned in the family. Cadmus, in order to conceal the diſhonour of his daughter, might, we imagine, convey away his infant grandſon to ſome of his relations in Phœnicia or

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(E) For the conqueſts and adventures of Oſiris and Iſis, we muſt ſend our learned readers to Diod. Sic. Bibli, l. i. and Plut. Iſis and Oſiris, p. 256. et ſeq. which we have been obliged to abridge, in conſequence of the narrow limits preſcribed us.

(F) Adonis is evidently the Hebrew *Adoni*, "my lord," and imports the ſovereignty of the deity.

(G) Bacchus is derived from the Phœnician word *bahab*, "to weep." This was the name embraced by the Romans.

(H) Exek chap. 8. ver. 14. *tammuz* is the name of one of the months of the Egyptian year.

(I) Cadmus and Melampus, who were both Egyptians, introduced the Bacchanalia into Greece. The Egyptian or oriental name of Bacchus was *Dinuſi*, that is "the prince of light." Cadmus had learned the name *Bacchus* from the Phœnicians.

(K) We have omitted the immenſe farrago of fable relating to the connection between Jupiter and Semele, as of little importance to our readers.

or Egypt. There he was educated and inſtructed in all the myſteries of Iſis and Oſiris, and at the ſame time initiated in all the magical or juggling tricks of the Egyptian prieſts and Hierophants. Thus accompliſhed, when he arrived at manhood he returned to Thebes with the traditional retinue of the original deity of the ſame name; and claimed divine honours accordingly. This claim, however, was not admitted without much oppoſition; Pentheus, another grandſon of Cadmus, was torn to pieces by the frantic Bacchanalians upon mount Citheron, becauſe he attempted to interrupt them in celebrating the orgia. Some have thought that Cadmus loſt his kingdom for the ſame reaſon; but this we think is by no means probable: we ſhould rather imagine that the old prince was privy to the whole proceſs, and that it was originally planned by him, with a view to attract the veneration of his new ſubjects, by making them believe that there was a divinity in his family.

35 The actions of Oſiris attributed to the Grecian Bacchus. Be that as it may, the vain-glorious Greeks attributed all the actions of the Egyptian hero to their new Bacchus: and according to their laudable practice, engaged him in numberleſs adventures in which his prototype had no ſhare. Moſt of thoſe are futile and unentertaining (L). The Greeks commonly adopted ſome oriental perſonage as the hero of their mythological rhapſodies. Him they naturaliſed and adopted into ſome Grecian family, and ſo he became their own. To him they aſcribed all the adventures and exploits of the oriental archetype from whom he was copied. Conſequently in the orgia (M), every thing was collected that had been imported from the eaſt relating to Oſiris; and to that farrago was joined all that the Grecian rhapſodiſts had thought fit to invent in order to amuſe the credulous multitude. This, however, was not the whole of the misfortune: The adventures of Oſiris were deſcribed by the Egyptian Hierophants, veiled with allegorical and hieroglyphical myſteries. Theſe the perſons who imported them into Greece did not thoroughly comprehend, or if they did, they were not inclined to communicate them ſound and unſophiſticated. Beſides, many oriental terms were retained, the import of which was in proceſs of time loſt or diſtorted. Hence the religious ceremonies of the Greeks became a medley of inconſiſtencies. The myſteries of Bacchus, in particular, were deeply tinctured with this meretricious colouring; the adventures of the Theban pretender were grafted upon thoſe of the Egyptian archetype, and out of this combination was formed a tiſſue of adventures diſgraceful to human nature, abſurd, and inconſiſtent. Indeed the younger or Theban Bacchus ſeems to have been a monſter of debauchery; whereas the Egyptian is repreſented as a perſon of an oppoſite character. Of courſe the myſteries of the former were attended with the moſt ſhocking abominations.

36 Myſteries of Bacchus ſpread into Greece, &c. Theſe myſteries, as has been obſerved above, were firſt celebrated at Thebes the capital of Bœotia, under the auſpices of the family of Cadmus. From this country they gradually found their way into Greece, and all the neighbouring parts of Europe. They were celebrated once every three years (N), becauſe at the end of three years Oſiris returned from his Indian expedition. As the Greeks had impudently transferred the actions of the Egyptian hero to their upſtart divinity, the ſame period of time was obſerved for the celebration of thoſe rites in Greece that had been ordained for the ſame purpoſe in Egypt.

37 Proceſs of their celebration. When the day appointed for the celebration of the orgia (O) approached, the prieſts iſſued a proclamation, enjoining all the initiated to equip themſelves acording to the ritual, and attend the proceſſion on the day appointed. The votaries were to dreſs themſelves in coats of deer-ſkins, to looſe the fillets of their hair, to cover their legs with the ſame ſtuff with their coats, and to arm themſelves with thyrſi, which were a kind of ſpears wholly of wood entwined with leaves and twigs of the vine or ivy. It is ſaid that the Bachanalians, eſpecially the Thracians, uſed often to quarrel and commit murder in their drunken revels; and that in order to prevent thoſe unlucky accidents, a law was enacted, that the votaries inſtead of real ſpears ſhould arm themſelves with thoſe ſham weapons which were comparatively inoffenſive. The ſtatue of the deity, which was always covered with vine or ivy leaves, was now taken down from its pedeſtal, and elevated on the ſhoulders of the prieſts. The cavalcade then proceeded nearly in the following manner:

Firſt of all, hymns were chanted in honour of Bacchus, who was called the *Power of dances, feaſts, and jeſts*; while at the ſame time he was deemed equally qualified for the exploits of war and heroiſm. Horace, in ſome of his dithyrambic odes, has conciſely pointed out the ſubjects of thoſe Bacchanalian ſongs. In the collection of hymns fabulouſly attributed to Orpheus, we find ſeveral addreſſed to this deity (P), each

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(L) Nonnus, an Egyptian of Pentapolis, has collected all the fabulous adventures of Bacchus, and exhibited them in a beautiful but irregular poem: To this we muſt refer our learned readers. Of the Dionyſiacs we have a moſt judicious ſketch, *Geblin. Calend.* p. 553. et ſeq.

(M) The orgia belonged to all the Mydones, but to thoſe of Bacchus in a peculiar manner.

(N) Hence theſe orgia were called *Triteria*.

(O) According to Clem. Alexand. Cohort. p. 12. Pott. the word *orgia* is derived from *orge*, which ſignifies "anger," and originated from the reſentment of Ceres againſt Jupiter, in conſequence of a moſt outrageous inſult he had offered her with ſucceſs. We ſhould rather imagine it derived from the Hebrew word *argoz*, ſignifying a "cheſt or coffer," alluding to the caſket which contained the ſacred ſymbols of the god.—The Egyptians or Phœnicians might write and pronounce, argoz, *orgoz*, or in ſome manner nearly reſembling *orgia*.

(P) Theſe ſtand between the 41 and 52; one to Lenæus, or the preſſer; one to Libnites, or the winnower; one to Beſſareus, or the vintager; one to Sabazius the god of reſt; to Myſes or the Mediator, &c.

each under a different title, derived from the different appellations of the god. All theſe names are of oriental original, and might eaſily be explained, did the bounds preſcribed us admit of etymological diſquiſitions.

The ſignal being fired, the firſt diviſion of the votaries proceeded, carrying a pitcher of wine, with a branch of the vine. Then followed the he-goat; an animal odious to Bacchus, becauſe he ravages the vines. The chanting the hymns, the ſacrificing the he-goat, and the revels, games, and diverſions, with which the celebration of theſe rites was attended, gave birth to the dramatic poetry of the Greeks; as the perſons habited in the dreſs of Fauns, Sylvians, and Satyrs (Q), furniſhed the name of another ſpecies of poetry of a more coarſe and forbidding aſpect.

38 The myſterious coffer, with its contents.

Then appeared the myſterious coffer or baſket, containing the ſecret ſymbols of the deity. Theſe were the phallus (R), ſome grains of ſeſama, heads of poppies, pomegranates, dry ſtems, cakes baked of the meal of different kinds of corn, ſalt, carded wool, rolls of honey, and cheeſe; a child, a ſerpent (S), and a fan (T). Such was the furniture of the ſacred coffer carried in the ſolemn Bacchanalian proceſſion. The inventory given by ſome of the fathers ‡ of the church is ſomewhat different. They mention the dye, the ball, the top, the wheel, the apples, the looking-glaſs, and the fleece. The articles firſt mentioned ſeem to have been of Egyptian original; the laſt were certainly ſuperinduced by the Greeks, in alluſion to his being murdered and torn in pieces when he was a child by the machinations of Juno, who prevailed with the Titans to commit the horrid deed. Theſe laſt ſeem to have been memorials of his boyiſh play things; for, ſays Maternus, "the Cretans §, in celebrating the rites of the child Bacchus, acted every thing that the dying boy either ſad, or did, or ſuffered. They likewiſe (ſays he) tore a live bull in pieces with their teeth, in order to commemorate the diſmembering of the boy." For our part, we think, that if ſuch a beaſtly rite was practiſed, it was done in commemoration of the ſavage manner of life which had prevailed among men prior to the more humane diet invented and introduced by Iſis and Oſiris. Be that as it may, we learn from Porphyry*, that in the iſland of Chios they uſed to ſacrifice a man to Bacchus, and that they uſed to mangle and tear him limb from limb. This was no doubt practiſed in commemoration of the cataſtrophe mentioned above.

‡ Clem. Alexand.

§ De errore prof. Gent.

39 Human ſacrifices.

* De Abſtinentia.

The orgia of this Pagan god were originally ſimple enough; but this unſophiſticated mode was of no long continuance, for riches ſoon introduced luxury, which quickly infected even the ceremonies of religion. On the day ſet apart for this ſolemnity, men and women crowned with ivy, their hair diſhevelled, and their bodies almoſt naked, ran about the ſtreets, roaring aloud *Evohe* (U) Bacche. In this rout were to be ſeen people intoxicated at once with wine and enthuſiaſm, dreſſed like Satyrs, Fauns, and Silenuſes, in ſuch ſcandalous poſtures and attitudes, with ſo little regard to modeſty and even common decency, that we are perſuaded our readers will readily enough forgive our omitting to deſcribe them. Next followed a company mounted upon aſſes, attended by Fawns, Bacchanals, Thyades, Mimallonides, Naids, Tityri, &c. who made the adjacent places echo to their frantic ſhrieks and howlings. After this tumultuous herd were carried the ſtatues of victory and altars in form of vineſets crowned with ivy, ſmoking with incenſe and other aromatics. Then appeared ſeveral chariots loaded with thyrſi, arms, garlands, caſks, pitchers, and other vaſes, tripods, and vans. The chariots were followed by young virgins of quality, who carried the baſkets and little boxes, which in general contained the myſterious articles above enumerated. Theſe, from their office, were called *ciſtophoræ* The phallophori (X) followed them, with a chorus of Itophallophori habited like Fauns, counterfeiting drunk perſons, ſinging in honour of Bacchus ſongs and catches ſuited to the occaſion. The proceſſion was cloſed by a troop of Bacchanalians crowned with ivy, interwoven with branches of yew and with ſerpents*. Upon ſome occaſions, at thoſe ſcandalous feſtivals, naked women whipped themſelves, and tore their ſkin in a moſt barbarous manner. The proceſſion terminated on mount Citheron, when it ſet out from Thebes; and in other places, in ſome diſtant unfrequented deſert, where the votaries practiſed every ſpecies of debauchery with ſecrecy

40 Total contempt of decency.

* Ovid. Met.

(Q) Dacier, Caſaubon, and other French critics, have puzzled and perplexed themſelves to little purpoſe about the origin of this word, without conſidering that it was coeval to dramatic poetry.

(R) The phallus was highly reſpected by the Egyptians, and was uſed as the emblem of the fecundity of the human race.

(S) That reptile was in high veneration among the Egyptians. See Euſeb. Præp. Evang. l. i. pag. 26. Steph. where we have a minute detail of the ſymbolical properties of that creature, according to Taautos the great legiſlator of that people.

(T) Servius in Georg. I. Virg. ver. 166. Myſtica *vanus* Iacchi. The fan, ſays he, is an emblem of that purifying influence of the myſteries by which the initiated were cleanſed from all their former pollutions, and qualified for commencing a holy courſe of life.

(U) Clem. Alexand. Cohort. pag. 11. Pott. derives this word from *Cheveh*, the mother of mankind, who firſt opened the gate to that and every other error: but we are rather inclined to believe that it comes from the original word *Hevé*, which ſignifies a "ſerpent;" which among the Egyptians was ſacred to the ſun, and was likewiſe the emblem of life and immortality. It then imported a prayer to Bacchus for life, vigour, health, and every other bleſſing.

(X) The phallus was the ſymbol of the fructifying power of Nature. The Itophallus was the type of that power in act.

crecy and impunity. Orpheus ſaw the degeneracy of thoſe ceremonies; and in endeavouring to reform them he probably loſt his life. Pentheus ſuffered in the like attempt, being torn in pieces by the Bacchanalians on the mount Citheron, among whom were his own mother and his aunts. The Greeks, who were an airy jovial people, ſeem to have paid little regard to the plaintive part of the orgia; or rather, we believe, they acted with howling and frantic exclamations, often inhanced by a combination of drunkenneſs, ecſtaſy, and enthuſiaſtic fury.

41
Doctrines inculcated in the orgia.

What ſecrets, religious, moral, political, or phyſical were communicated to the votaries, it is impoſſible to determine with any degree of certainty.—One thing we may admit, namely, that the doctrines diſcovered and inculcated in the orgia, were originally the very ſame which the apoſtles of the ſect had imbibed in Egypt and Phœnicia; and of which we have given a brief account near the beginning of this article. It is however, probable that the ſpurious or Theban Bacchus had ſuperadded a great deal of his own invention, which, we may believe, was not altogether ſo ſound and ſalubrious as the original doctrine. However that may be, the initiated were made to believe that they were to derive wonderful advantages from the participation of theſe rites, both in this life and that which is to come. Of this, however, we ſhall talk more at length by and by in our account of the Eleuſinian myſteries.

To detail the etymology of the names of this Pagan deity, the fables relating to his birth, his education, his transformations, his wars, peregrinations, adventures, the various and multiform rites with which he was worſhiped, would ſwell this article to a moſt immoderate ſize. If any of our readers ſhould wiſh to be more minutely and more accurately acquainted with this ſubject, we muſt beg leave to remit them to Diod. Sic. Apollod. Bibl. Euripid. Bacchæ. Ariſtophane Ranæ, Nonn Dionyſ. and among the moderns, to Ban. Mythol. Voſſ. de. origi. Idol. Monſ. Fourmount, Reflections ſur l'origine anciens peuples, Mr Bryant's Analyſ. and eſpecially to Mons Cour de Gebelin, Calendries ou Almanach. That prince of etymologiſts, in his account of the feſtival of Bacchus, has given a moſt acute and ingenious explication of the names and epithets of that deity. For our part, we have endeavoured to collect and exhibit ſuch as we judged moſt important, moſt entertaining, and moſt inſtructive, to the leſs enlightened claſſes of our readers.

42
Eleuſinian myſteries inſtituted in honour of Ceres.

We now proceed to the Eleuſinian myſteries, which, among the ancient Greeks and Romans, were treated with a ſuperior degree of awe and veneration. Theſe were inſtituted in honour of Ceres, the goddeſs of corn; who, according to the moſt authentic accounts, was the Iſis of the Egyptians. The myſteries of Oſiris and Iſis have been hinted at in the preceding part of this article. They were originally inſtituted in honour of the ſun and moon, and afterwards conſecrated to an Egyptian prince and princeſs; who, in conſequence of their merits, had been deified by that people. We know of no more exact and brilliant deſcription of the ceremonies of that goddeſs, in the moſt poliſhed ages of the Egyptian ſuperſtition, than what we meet with in the witty and florid Apuleius *, to which we muſt take the liberty to refer our more curious readers. Our buſineſs at preſent ſhall be to try to inveſtigate by what means, and upon what occaſion theſe myſteries were introduced into Attica, and eſtabliſhed at Eleuſis. A paſſage from Diodorus Siculus §, which we ſhall here tranſlate, will, we think, throw no inconſiderable light on that abſtruſe part of the ſubject.

43
On what occaſion introduced into Attica.

“ In like manner with him (Cecrops), ſays that judicious hiſtorian, they tell us, that Erectheus, a prince of Egyptian extraction, once reigned at Athens. Of this fact they produce the following evidence: A ſcorching drought, during the reign of this prince, prevailed over almoſt all the habitable world, except Egypt; which, in conſequence of the humidity of its ſoil, was not affected by that calamity. The fruits of the earth were burnt up; and at the ſame time multitudes of people periſhed by famine. Erectheus, upon this occaſion, as he was connected with Egypt, imported a vaſt quantity of grain from that country to Athens. The people, who had been relieved by his magnificence, unanimouſly elected him king. Being inveſted with the government, he taught his ſubjects the myſteries of Ceres at Eleuſis and the mode of celebrating the ſacred ceremonies, having tranferred from Egypt the ritual for that purpoſe. In thoſe times the goddeſs is ſaid to have made her appearance at Athens three ſeveral times; becauſe, according to tradition, the fruits of the earth which bear her name were then imported into Attica. On this account the ſeeds and fruits of the earth were ſaid to be the invention of that deity. Now the Athenians themſelves acknowledge, that, in the reign of Erectheus, the fruits of the earth having periſhed for want of rain, the arrival of Ceres in their country did actually happen, and that along with her the bleſſing of corn was reſtored to the earth. They tell us at the ſame time, that the teletæ and the myſteries of that goddeſs were then received and inſtituted at Eleuſis.”

Here then we have the whole myſtery of the arrival of Ceres in Attica, and the inſtitution of her myſtery at Eleuſis unveiled. The whole is evidently an oriental allegory. The fruits of the earth had been deſtroyed by a long courſe of drought; Egypt, by its peculiar ſituation, had been preſerved from that dreadful calamity. Erectheus, in conſequence of his relation to the Egyptians, imported from their country a quantity of grain, not only ſufficient for the conſumption of his own ſubjects, but alſo a great overplus to export to other parts of Greece, Sicily, Italy, Spain, &c. Triptolemus, another Egyptian, was appointed by Erectheus to export this ſuperfluous ſtore. That hero, according to Pherecydes, was the ſon of Oceanus and Tellus, that is, of the ſea and the earth; becauſe his parents were not known, and becauſe he came to Eleuſis by ſea. The ſhip in which he ſailed, when he diſtributed his corn to the weſtern parts of the world, was decorated with the figure of a winged dragon: therefore, in the allegorical ſtyle of his country he was ſaid to be wafted through the air in a chariot drawn by dragons. Thoſe creatures, every body knows, were held ſacred by the Egyptians.

Wherever Triptolemus diſpoſed of his corn thither were extended the wanderings of Ceres. In order to elucidate

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* Lib. II.

§ Lib. I.

elucidate this point, we muſt obſerve that along with the grain imported from Egypt, Erectheus, or Triptolemus, or both tranſported into Attica a cargo of prieſts and prieſteſſes from the temples of Buſiris, a city which lay in the § centre of the Delta, where the goddeſs Iſis had a number of chapels erected for her worſhip. The preſidents of theſe ceremonies, like all other bigots, gladly laid hold on this opportunity of propagating their religious rites, and diſeminating the worſhip of the deities of their country. That the Egyptian prieſts were zealous in propagating the dogmas of their ſuperſtition, is abundantly evident from the extenſive ſpreading of their rites and ceremonies over almoſt all Aſia and a conſiderable part of Europe. The Greek and Roman idolaty is known to have originated from them; and numberleſs monuments of their impious worſhip are ſtill extant in Perſia ‡, India, Japan, Tartary, &c. Our inferenee then is, that the worſhip of Iſis was introduced into every country where Triptolemus ſold or diſpoſed of his comodities.—Hence the wanderings of Ceres in ſearch of her daughter Proſerpine, who is generally called *Core.* The famine occaſioned by the drought deſtroying the fruits of the ground, imports the loſs of Proſerpine. The reſtoration of the corn in various parts of the earth, by freſh ſupplies from Egypt from time to time, imports the wanderings of Ceres in queſt of Proſerpine. The whole proceſs is an oriental allegory. The diſappearing of the fruits of the earth, of which Proſerpine, or Perſephone*, or Pereſephone (Y), is the emblem, is the allegorical rape of that goddeſs. She was ſeized and carried off by Pluto, ſovereign of the infernal regions. The ſeed committed to the earth in that dry ſeaſon appeared no more, and was, conſequently, ſaid to dwell under ground with Pluto. It was then that Ceres, that is, corn imported from Egypt, ſet out in queſt of her daughter. Again, when the earth recovered her priſtine fertility, the Core, or maid, was found by her mother Ceres, that is, the earth; for Iſis, among the Egyptians frequently ſignified the earth. The wanderings of Iſis in ſearch of Oſiris furniſhed the model for the peregrinations of Ceres.

§ Herod. Lib. 2.

‡ Aſiatic Reſearches, vol. i. and ii.

* Plutarch. Iſis et Oſir.

44
Different names of Ceres.

Ceres, the Roman name of the goddeſs of corn, was unknown to the modern greeks, They always denominated her *Damater* (Z), which is rather an epithet than a proper name. The Greeks, who always affected to paſs for originals, we think ſuppreſſed the Egyptian name on purpoſe, to conceal the country of that deity. As a proof of the probability of this conjecture it may be obſerved, that they metamorphoſed the wanderings of Iſis in ſearch of Oſiris into the peregrinations of Ceres in queſt of Proſerpine. The Romans, who were leſs ambitious of the character of originality, retained one of her oriental names (A). Ceres, ſays Diodorus, appeared thrice in Attica during the reign of Erectheus; which ſeems to import, that fleets loaded with corn had thrice arrived in that country from Egypt during that period.

45
Contentions at Athens reſpecting Minerva and Neptune the immediate cauſe of fixing the myſteries at Eleuſis.

Cecrops the firſt king of Attica had eſtabliſhed the worſhip of the Saitic Athena or Minerva in that region and conſecrated his capital to that deity. Erectheus, in his turn introduced the worſhip of Iſis or Damater who in all appearance was the tutelar deity of Buſiris his native city. The ſubjects of Cecrops were a colony of Saites, and readily embraced the worſhip of Minerva; but the aborigines of that diſtrict being accuſtomed to a maritime, perhaps to a piratical courſe of life, were more inclined to conſecrate their city to Neptune the god of the ſea, and to conſtitute him their guardian and protector. Cecrops by a ſtratagem ſecured the preference to Minerva his favourite divinity. Erectheus, in order to give equal importance to his patroneſs, had the addreſs to inſtitute the Eleuſinian myſteries; and to accompliſh his deſign laid hold on the opportunity abovementioned.

This appears to us the moſt probable account of the origin and inſtitution of the Eleuſinian myſteries; for which the Sicilian hiſtorian has indeed furniſhed the clue. We ſhall now proceed to detail ſome other circumſtances which attended the original inſtitution of theſe far-famed ceremonies.

46
Circumſtances attending the firſt appearance of Ceres in Attica.

The archprieſteſs who perſonated the newly imported deity was entertained by one Celeus*, who was either viceroy of that petty diſtrict of which Eleuſis was the capital, or ſome conſiderable perſonage in that city or its neighbourhood. Upon her immediate arrival, according to the fabulous relations of the Greeks, a farce was acted not altogether ſuitable to the character of a goddeſs whoſe myſteries were one day to be deemed ſo ſacred and auſtere. Theſe coarſe receptions, and other indecencies attending the firſt appearance of the goddeſs, that is the Egyptian dame who aſſumed her character, were copied from the like unhallowed modes of behavionr practiſed on occaſion of the ſolemn proceſſions of her native country. Theſe ſcommata, or coarſe jokes, had an allegorical ſignification in Egypt; and among the moſt ancient Greeks the very ſame ſpirit was univerſally diſuſed by the oriental coloniſts who from time to time arrived and ſettled among them. In proceſs of time they abandoned the figurative and allegorical ſtyle, in conſequence of their acquaintance with philoſophy and abſtract reaſoning.

* Appollod Bibl. Lib. 3. cap. 13.

(Y) This word ſeems to be formed of two Hebrew terms, *phri* "fruit," and *tzaphon*; or *tzephon*, "abſcondit, recondidit."

(Z) Damater is compounded of the Chaldiac particle *da* "the," and *mater* "mother." As Iſis often ſignified the earth, the Greeks naturally adopted that title; becauſe, according to them, that element is the mother of all living. In the very ſame manner they diſcarded the word *Juno*, an original title of the moon; and ſubſtituted *Hera*, which intimates "miſtreſs or lady."

(A) According to ſome of the Latin etymologiſts, *Ceres*, or rather *Geres*, is derived from *gero* "to bear, to carry," becauſe the earth bears all things; or becauſe that element is the general fruit-bearer. But as this term came to Italy immediately from the eaſt, and not by the medium of Greece, we would rather incline to adopt an oriental etymology. The Hebrew word *cheres* ſignifies *arare* "to plow:" a name naturally applicable to the goddeſs of huſbandry.

reaſoning. In the ceremonies of religion, however, the ſame allegorical and typical repreſentations which had been imported from the eaſt were retained; but the Grecian hierophants in a ſhort time loſt every idea of their latent import, and religious, moral, or phyſical interpretation. Accordingly, this ſhameful rencounter between Ceres and Banbo (B), or Jambe, was retained in the myſteries, though we think it was copied from Egypt, as was ſaid above, where even that obſcene action was probably an allegorical repreſenation of ſomething very different from what appeared to the Greeks.

Ceres and Bacchus, who they were.

At the ſame time that Ceres arrived in Attica, Bacchus likewiſe made his appearance in that country. He was entertained by one Icarus; whom, as a reward for his hoſpitality, he inſtructed in the art of cultivating the vine, and the method of manufacturing wine. Thus it appears that both agriculture and the art of managing the vintage were introduced into Athens much about the ſame time. Ceres was no other than a prieſteſs of Iſis; Bacchus was no doubt a prieſt of Oſiris. The arrival of thoſe two perſonages from Egypt, with a number of inferior prieſts in their train, produced a memorable revolution in Athens, both with reſpect to life, manners, and religion. The ſacred rites of Iſis, afterwards ſo famous under the name of the Eleuſinian myſteries, date their inſtitution from this period.

When this company of propaganda arrived at Eleuſis, they were entertained by ſome of the moſt reſpectable perſons who then inhabited that diſtrict. Their names, according to Clem. Alexand. were Banbo, Dyſaulis, Triptolemus, Eumolpus, and Eubulus. From Eumolpus were deſcended a race of prieſts called Eumolpidæ, who figured at Athens many ages after. Triptolemus was an ox-herd, Eumulpus a ſhepherd, and Eubulus a ſwine-herd. Theſe were the firſt apoſtles of the Eleuſinian myſteries. They were inſtructed by the Egyptian miſſionaries; and they, in their turn, inſtructed their ſucceſſors. Erectheus, or, as ſome ſay, Pandion, countenanced the ſeminary, and built a ſmall temple for its accemodation in Eleuſis, a city of Attica, a few miles weſt from Athens, and originally one of the twelve diſtricts into which that territory was divided. Here then we have arrived at the ſcene of thoſe renowned myſteries, which for the ſpace of near 2000 years were the pride of Athens and the wonder of the world.

48 Eleuſinian myſteries divided into greater and leſſer.

The myſteries were divided into the greater and leſſer. The latter were celebrated at Agræ, a ſmall town on the river Ilyſſus; the former were celebrated in the month which the Athenians called Boedromion (C); the latter in the month Antheſterion (D). The leſſer myſteries, according to the fabulous legends of the Greeks, were inſtituted in favour of the celebrated Hercules. That hero being commanded by Euryſtheus to bring up Cerberus from the infernal regions, was deſirous of being initiated in the Eleuſinian myſteries before he engaged in that perilous undertaking. He addreſſed himſelf to Eumolpus the hierophant for that purpoſe. There was a law among the Eleuſinians prohibiting the initiation of foreigners. The prieſt not daring to refuſe the benefit to Hercules who was both a friend and benefactor to the Athenians, adviſed the hero to get himſelf adopted by a native of the place, and ſo to elude the force of the law. He was accordingly adopted by one Pylius, and ſo was initiated in the leſſer myſteries which were inſtituted for the firſt time upon that occaſion. This account has all the air of a fable. The leſſer myſteries were inſtituted by way of preparation for the greater.

49 Auſterities and rites previous to initiation.

The perſon who was to be initiated in the leſſer myſteries, as well as in the greater, was obliged to practiſe the virtue of chaſtity a conſiderable time before his admiſſion. Beſides, he was to bind himſelf by the moſt ſolemn vows not to divulge any part of the myſteries. At the ſame time, he was, according to the original inſtitution, to be a perſon of unblemiſhed moral character. Theſe were preliminaries indiſpenſably neceſſary in order to admiſſion. A bull was ſacrificed to Jupiter, and the hide of that animal called by a peculiar name (Διος Κωδιον), was carefully preſerved and carried to Eleuſis, where it was ſpread under the feet of the initiated. The candidate was then purified by bathing in the river Ilyſſus, by aſperſions with ſalt water or ſalt, with laurel barley, and paſſing through the fire: all which rites were attended with incantations and other uſages equally inſignificant and ridiculous. Laſt of all, a young ſow was ſacrificed to Ceres; and this animal, according to the ritual, behoved to be with pigs: and before it was killed it was to be waſhed in Cantharus, one of the three harbours which formed the Piræus.

50 Into the leſſer myſteries; of which

All theſe ceremonies duly performed, the candidate was carried into the hall appointed for the purpoſe of initiation. There he was taught the firſt elements of thoſe arcana which were afterwards to be more fully and more clearly revealed in the more auguſt myſteries of Eleuſis. The pupils at Agræ were called *Myſtæ*, which may intimate probationers; whereas thoſe of Eleuſis were denominated *Epoptæ*, importing that they ſaw as they were ſeen.

51 There were ſeveral ſtages, with long intervals between them.

The leſſer myſteries were divided into ſeveral ſtages, and candidates were admitted to them according to their quality and capacity reſpectively. Thoſe who were initiated in the loweſt were obliged to wait five years before they were admitted to the greater. Thoſe who had partaken of the ſecond kind underwent a noviciate of three years; thoſe who had been admitted to the third, one of two years; and thoſe who had gone through the fourth were admitted to the greater at the end of one year; which was the ſhorteſt period of probation a candidate for that honour could legally undergo. Such was the proceſs generally obſerved in adminiſtering the leſſer myſteries.

With

(B) Apollod Bib. ubi ſupra. Clem. Alexand. Cahod. page 17. where the ſtory is told with very little reſerve.

(C) The third month of the Athenian year, anſwering to our September.

(D) The eighth month, anſwering to our February; but Meurſius makes it November.

52 None but natives of Athens originally admitted to the greater myſteries.

With reſpect to the greater myſteries, it is probable that originally none but the natives of Attica were admitted to partake of them. In proceſs of time, however, the pale was extended ſo far and wide as to comprehend all who ſpoke the Greek language. All foreigners were debarred from thoſe ſacred rites. They tell us, however, that Hercules, Bacchus, Caſtor and Pollux, Æſculapius and Hippocrates, were initiated in an extraordinary manner, from a regard to their high character and heroic exploits. All barbarians. too, were excluded: yet Anacharſis the Scythian was indulged that privilege, in conſequence of his reputation for ſcience and philoſophy. All perſons guilty of manſlaughter, though even accidentally or involuntarily, all magicians, enchanters; in a word, all impious and profane perſons, were expreſsly prohibited the benefit of this pagan ſacrament. At laſt, however, the gate became wider, and crowds of people, of all nations, kindreds, and languages, provided their character was fair and irreproachable, ruſhed in by it. In proceſs of time the Athenians initiated even their infants; but this, we imagine, muſt have been a kind of luſtration or purification from which it was ſuppoſed that they derived a kind of moral ablution from vice, and were thought to be under the peculiar protection of the goddeſs.

53 Celebration laſted nine days; but

The celebration of the myſteries began on the 15th day of the month Boedromion; and, according to the moſt ancient authors, laſted nine days. Meurſius has enumerated the tranſactions of each day, which are much too numerous to fall within the compaſs of this article; we muſt therefore refer our curious reader to the author juſt mentioned. Some days before the commencement of the feſtival, the præcones, or public criers, invited all the initiated, and all the pretenders to that honour, to attend the feſtival, with clean hands and a pure heart, and the knowledge of the Greek language.

54 Was performed only during the night.

55 The Mundus Cereris.

On the evening of the 15th day of the month called *Boedromion* the initiations commenced. Our readers will obſerve, that all the moſt ſacred and ſolemn rites of the pagan ſuperſtition were performed during the night: They were indeed generally works of darkneſs. On this day there was a ſolemn cavalcade of Athenian matrons from Athens to Eleuſis in carriages drawn by oxen. In this proceſſion the ladies uſed to rally one another in pretty looſe terms, in imitation, we ſuppoſe, of the Iſiac proceſſion deſcribed by Herodotus, which has been mentioned above. The moſt remarkable object in this proceſſion was the Mundus Cereris, contained in a ſmall coffer or baſket. This was carried by a ſelect company of Athenian matrons, who, from their office, were ſtyled *Camphoeræ*. In this coffer were lodged the comb of Ceres, her mirror, a ſerpentine figure, ſome wheat and barley, the pudenda of the two ſexes, and perhaps ſome other articles which we have not been able to diſcover. The proceſſion ended at the temple, where this ſacred charge was depoſited with the greateſt ſolemnity.

56 Dreſs of the candidates.

57 Care to keep the uninitiated at a diſtance.

We have no deſcription of the temple of Eleuſis upon record. Pauſanias intended to have deſcribed it; but ſays he was diverted from his deſign by a dream ||. Strabo informs us that the myſtic ſanctuary was as large as a theatre, and that it was built by Ictinus *. In the porche, or outer part of this temple the candidates were crowned with garlands of flowers, which they called *Himera*, or "the deſirable." They were at the ſame time dreſſed in new garments, which they continued to wear till they were quite worn out. Then they waſhed their hands in a laver filled with holy water; a ceremony which intimated the purity of their hearts and hands. Before the doors were locked, one of the officers of the temple proclaimed with a loud voice a ſtern mandate, enjoining all the uninitiated to keep at a diſtance from the temple, and denouncing the moſt terrible menaces if any ſhould dare to diſturb or pry into the holy myſteries. Nor were theſe menannces without effect; for if any perſon was found to have crowded into the ſanctuary even through ignorance, he was put to death without mercy. Every precaution having been taken to ſecure ſecrecy, the initiatory ceremonies now began. But before we deſcribe theſe, we muſt lay before our readers a brief account of the miniſters and retainers of theſe ſecrets of paganiſm.

58 The hierophant.

The chief miniſter of theſe far-famed myſteries was the Hierophant. He was ſtyled *King*, and enjoyed that dignity during life, and was always by birth an Athenian. He preſided in the ſolemnity, as is evident from his title. This perſonage, as we learn from Euſebius, repreſented the Demiurgus, or Creator of the world. "Now in the myſteries of Eleuſis (ſays that father) the hierophant is dreſſed out in the figure of the demiurgus." What this demiurgus was, we learn from the ſame writer. As this whole inſtitution was copied from the Egyptians, we may reſt aſſured that the figure of the Eleuſinian Demiurgus was borrowed from the ſame quarter. "As for the ſymbols of the Egyptians (ſays he, quoting from Porphyry *) they are of the following complexion. The Demiurgus, whom the Egyptians call *Cneph*, is figured as a man of an azure colour, ſhaded with black, holding in his right hand a ſceptre and in his left a girdle, and having on his head a royal wing or feather wreathed round." Such, we imagine, was the equipment of the Eleuſinian hierophant. This perſon was likewiſe ſtyled *Prophet*. He was to be of the family of the Eumolpidæ; was obliged to make a vow of perpetual chaſtity, and even his voice, hair, and attitude, were adjuſted to the ritual.

59 The daduchus.

The next miniſter was the Daduchus, or torch-bearer; who, according to the father above quoted, was attired like the ſun. This miniſter reſembled the ſun, becauſe that luminary was deemed the viſible type of the ſupreme Demiurgus, and his vicegerent in governing and arranging the affairs of this lower world.

60 The prieſts.

The third was the perſon who officiated at the altar. He was habited like the moon. His office was to implore the favour of the gods for all the initiated- We ſhould rather imagine, that the perſon at the altar, as he reſembled the moon, was intended to repreſent the goddeſs herſelf: for the Egptian Iſis, who was the archetype of Ceres was ſometimes the moon and ſometimes the earth.

61 The herald.

The ſacred herald was another principal actor in this ſolemn exhibition. His province was to recite every thing that, according to the ritual, was to be communicated to the novices; and he probably repreſented Thyoth or Thoth, that is Hermes or Mercury, the interpreter of the gods.

|| Lib. 9.

* See Eleuſi

* Prep. Evan.

The curators.

Beſides theſe, there were five epimeletæ or curators, of whom the king was one, who jointly directed the whole ceremonial. Laſtly there were ten prieſts to offer the ſacrifices. There were no doubt many officers of inferior note employed upon theſe occaſions, but theſe were only inſignificant appendages, whoſe departments have not been tranſmitted to poſterity.

After this detail of the miniſters of this ſolemn ſervice, we return to the *myſtæ*, or candidates for initiation. Some of the fathers of the church † mention a hymn compoſed by the celebrated Orpheus, which was ſung by the myſtagogue or king upon that occaſion. This hymn appears to us one of thoſe ſpurious compoſitions which abounded in the firſt ages of Chriſtianity, and which the pious apologiſts often adopted without ſufficient examination. That ſome ſacred hymn was chanted upon that occaſion, we think highly probable; but that the one in queſtion was either compoſed by Orpheus, or uſed at the opening of theſe ceremonies, to us appears ſomewhat problematical.

63 The petroma.

Before the ceremony opened, a book was produced, which contained every thing relating to the teletæ. This was read over in the ears of the myſtæ; who were ordered to write out a copy of it for themſelves. This book was kept at Eleuſis in a ſacred repoſitory, formed by two ſtones exactly fitted to each other, and of a very large ſize. This repoſitory was called *petroma*. At the annual celebration of the greater myſteries, theſe ſtones were taken aſunder, and the book taken out; which, after being read to the myſtæ, was replaced in the ſame caſement.

64 Commencement of the initiations.

The initiations began with a repreſentation of the wanderings of Ceres, and her bitter and loud lamentations for the loſs of her beloved daughter. Upon this occaſion, no doubt, a figure of that deity was diſplayed to the myſtæ, while loud lamentations echoed from every corner of the ſanctuary. One of the company having kindled a firebrand at the altar, and ſprung to a certain place in the temple, waving the torch with the utmoſt fury, a ſecond ſnatched it from him, roaring and waving it in the ſame frantic manner: then a third, fourth, &c. in the moſt rapid ſucceſſion. This was done to imitate Ceres, who was ſaid to have perluſtrated the globe of the earth with a flaming pine in her hand, which ſhe had lighted at mount Etna.

65 Queſtions put to the myſtæ.

When the pageant of the goddeſs was ſuppoſed to arrive at Eleuſis, a ſolemn pauſe enſued, and a few trifling queſtions were put to the myſtæ: What theſe queſtions were, is evident from the anſwers, "I have faſted; I have drunk the liquor: I have taken the contents out of the coffer, and having performed the ceremony, have put them into the hamper: I have taken them out of the hamper, and put them again in the coffer." The meaning of theſe anſwers, we conjecture, was this; "I have faſted as Ceres faſted while in ſearch of her daughter: I have drunk of the wort as ſhe drank when given her by Banbo; I have performed what Ceres taught her firſt diſciples to perform, when ſhe committed to them the ſacred hamper and coffer." After theſe interrogatories and the ſuitable reſponſes, the *mundus Cereris* was diſplayed before the eyes of the myſtæ, and the *myſtagogue* or hierophant; or perhaps the ſacred herald by his command, read a lecture on the allegorical import of thoſe ſacred ſymbols. This was heard with the moſt profound attention; and a ſolemn ſilence prevailed throughout the fane. Such was the firſt act of this religious farce, which perhaps conſiſted originally of nothing more.

66 Traditions reſpecting the origin of the univerſe.

After the expoſition of the *mundus Cereris*, and the import of her wanderings, many traditions were communicated to the myſtæ concerning the origin of the univerſe and the nature of things. "The doctrines delivered in the greater myſteries, ſays Clem. Alex. "relate to the nature of the univerſe. Here all inſtruction ends. Things are ſeen as they are: and nature and the things of nature, are given to be comprehended." To the ſame purpoſe Cicero: "Which points being explained and reduced to the ſtandard of reaſon, the nature of things, rather than that of the gods, diſcovered." The father of the univerſe, or the ſupreme demiurgus, was repreſented as forming the chaotic maſs into the four elements, and producing animals, vegetables, and all kinds of organized beings, out of thoſe materials. They ſay that they were informed of the ſecrets of the anomalies of the moon; and the eclipſes of the ſun and moon; and, according to Virgil,

Unde hominum genus, et pecudes, unde imber et ignes.

What ſyſtem of coſmogony thoſe hierophants adopted, is evident from the paſſage above quoted from Euſebius: and, from the account immediately preceding, it was that of the moſt ancient Egyptians, and of the orientals in general. This coſmogony is beautifully and energetically exhibited in Plato's Timæus, and in the genuine ſpirit of poetry by Ovid in the beginning of his Metamorphoſes.

67 Exploits of the gods, and

The next ſcene exhibited upon the ſtage, on this ſolemn occaſion, conſiſted of the exploits and adventures of the gods, demigods, and heroes, who had, from time to time, been advanced to divine honours. Theſe were diſplayed as paſſing before the myſtæ in pageants fabricated for that important purpoſe. This was the original mode among the Egyptians, and was no doubt followed by their Eleuſinian pupils. Thoſe adventures were probably demonſtrated to have been allegorical, ſymbolical, hieroglyphical, &c. at leaſt they were exhibited in ſuch a favourable point of view as to diſpel thoſe abſurdities and inconſiſtencies with which they were ſophiſticated by the poets and the vulgar.

68 Their origin.

With reſpect to the origin of thoſe fictitious deities, it was diſcovered that they had been originally men who had been exalted to the rank of divinity, in conſequence of their heroic exploits, their uſeful inventions, their beneficent actions, &c. This is ſo clear from the two paſſages quoted from Cicero, by biſhop Warburton †, that the fact cannot be contradicted. But that prelate has not informed us ſo preciſely, whether the myſtagogues repreſented them as nothing more than dead men, in their preſent ſtate, or as beings who were actually exiſting in a deified ſtate, and executing the functions aſſigned them in the rubric of paganiſm. Another query naturally occurs, that is, to what purpoſe did the myſtagogues apply this communication? That the hierophants did actually repreſent thoſe deified mortals in the latter predicament, is obvious from another paſſage quoted from Cicero by the ſame prelate, which we ſhall tranſcribe as tranſlated by him; " What think you of thoſe who aſſert that valiant, or famous, or powerful men, have obtained divine honours after death: and that theſe are the very gods now become the objects of our worſhip, our prayers, and adoration? Euhemerus tells us, when theſe gods died, and where they lie buried. I forbear to ſpeak of the ſacred and auguſt rites of Eleuſis. I paſs by Samothrace and the myſteries of Lemnos, whoſe hidden rites are celebrated in darkneſs, and amidſt the thick ſhades of groves and foreſts." If, then thoſe deified mortals were become the objects of worſhip and prayers, there can be no doubt of the belief of their deified exiſtence. The alluſion to the Eleuſinian and other pagan myſteries towards the cloſe of the quotation, places the queſtion beyond the reach of controverſy. But though, according to this account, " there were gods many and lords many;" yet it is evident from the paſſage quoted from Euſebius in the preceding part of this article, that the unity of the Supreme Being was maintained, exhibited, and inculcated. This was the original doctrine of the Hierophants of Egypt: It was maintained by Thales and all the retainers of the Ionian ſchool. It was the doctrine of Pythogoras, who, probably gleaned it up in the country juſt mentioned, in connection with many other dogmas which he had the aſſurance to claim as his own.

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† Juſtin. Euſeb. Clem.

† Div. Leg.

69
Unity of the Supreme Being maintained in the myſteries.

But however the unity, and perhaps ſome of the moſt obvious attributes of the Supreme Author of nature, might be illuſtrated and inculcated, the tribute of homage and veneration due to the ſubordinate divinities was by no means neglected. The initiated were taught to look to the *dii majorum gentium* with a ſuperior degree of awe and veneration, as beings endowed with an ineffable meaſure of power, wiſdom, purity, goodneſs, &c. Theſe were, if we may uſe the expreſſion, the prime favourites of the Monarch of the univerſe, who were admitted into his immediate preſence, and who received his beheſts from his own mouth, and communicated them to his ſubordinate officers, prefects, lieutenants, &c. Theſe they were exhorted to adore; to them they were to offer ſacrifices, prayers, and every other act of devotion, both on account of the excellency of the nature and the high rank they bore at the court of heaven. They were inſtructed to look up to hero gods and demi-gods, as beings exalted to the high rank of governors of different parts of nature, as the immediate guardians and protectors of the human race; in ſhort, as gods near at hand, as prompters to a virtuous courſe, and aſſiſtants in it; as ready upon all occaſions to confer bleſſings upon the virtuous and deſerving. Such were the doctrines taught in the teletæ with reſpect to the nature of the Pagan divinities, and the worſhip and devotion enjoined to be offered them by the myſteries.

70
Offices of the other gods.

71
Excellent plan for accompliſhing the ends propoſed in the myſteries.

As the two principal ends propoſed by theſe initiations were the exerciſe of heroic virtues in men, and the practice of ſincere and uniform piety by the candidates for immortal happineſs, the hierophants had adopted a plan of operations excellently accommodated to both theſe purpoſes. The virtuous conduct and heroic exploits of the great men and demigods of early antiquity, were magnified by the moſt pompous elogiums, enforced with ſuitable exhortations to animate the votaries to imitate ſo noble and alluring an example. But this was not all; the heroes and demigods themſelves were diſplayed in pageants, or vehicles of celeſtial light. Their honours, offices, habitations, attendants, and other appendages, in the capacity of demons, were exhibited with all the pomp and ſplendor that the ſacerdotal college were able to deviſe. The ſudden glare of mimic light, the melting muſic ſtealing upon the ear, the artificial thunders reverberated from the roof and walls of the temple, the appearance of fire and etherial radiance the vehicles of flame, the effigies of heroes and demons adorned with crowns of laurel emitting rays from every ſprig, the fragrant odours and aromatic gales, which breathed from every quarter, all dexterouſly counterfeited by ſacerdotal mechaniſm, muſt have filled the imagination of the aſtoniſhed votaries with pictures at once tremendous and tranſporting; Add to this, that every thing was tranſacted in the dead of night amidſt a diſmal gloom: whence the moſt bright effulgence inſtantaneouſly burſt upon the ſight. By this arrangement the aſpirants to initiation were wonderfully animated to the practice of virtue while they lived, and inſpired with the hope of a bleſſed immortality when they died. At the ſame time, their awe and veneration for the gods of their country was wonderfully enhanced by reflecting on the appearances above deſcribed. Accordingly Strabo very judiciouſly obſerves, " that the myſtical ſecrecy of the ſacred rites preſerves the majeſty of the Deity, imitating its nature, which eſcapes our apprehenſion. For theſe reaſons, in celebrating the teletæ, the demons were introduced in their deified or glorified ſtate.

But as all the candidates for initiation might not aſpire to the rank of heroes and demigods, a more eaſy and a more attainable mode of conduct, in order to arrive at the palace of happineſs, behoved to be opened. Private virtues were inculcated, and theſe too were to meet a condign reward. But alas, this preſent life is too often a chequered ſcene, where virtue is depreſſed and trodden under foot, and vice lifts up its head and rides triumphant. It is a dictate of common ſenſe, that virtue ſhould ſooner or later emerge, and vice ſink into contempt and miſery. Here then the conductors of the myſteries properly and naturally, adopted the doctrine of a future ſtate of rewards and puniſhments. The dogma of the immortality of the human ſoul was elucidated, and carefully and pathetically inculcated. This doctrine was likewiſe imported from Egypt; for Herodotus† informs us, " that the Egyptians were the firſt people who maintained the immortality of the human ſoul." The Egyptian immortality, however, according to him, was only the metempſychoſis or tranſmigration of ſouls. This was not the ſyſtem of the ancient Egyptians, nor indeed of the teletæ. In theſe, a metempſychoſis was admitted; but that was carried forward to a very diſtant period, to wit, to the grand Egyptian period of 36,000 years.

72
Private virtues inculcated by the doctrine of a future ſtate.

† Lib. 2.

As the Myſtagogues well knew that the human mind is more powerfully affected by objects preſented to the eyes than by the moſt engaging inſtructions conveyed

by

73 Emblems of Elyſium and Tartarus.

by the ear, they made the emblems of Elyſium and Tartarus paſs in review before the eyes of their novices. There the Elyſian ſcenes, ſo nobly deſcribed by the Roman poet, appeared in mimic ſplendor; and on the other hand, the gloom of Tartarus, Charon's boat, the dog of hell, the furies with treſſes of ſnakes, the tribunal of Minos and Rhdamanthus, &c. were diſplayed in all their terrific ſtate. Tantalus, Ixion, Siſyphus, the daughters of Danaus, &c. were repreſented in pageants before their eyes. Theſe exhibitions were accompanied with moſt horrible cries and howlings, thunders, lightning, and other objects of terror, which we ſhall mention in their proper place.

74 The three laws of Triptolemus.

No contrivance could be better accommodated to animate the pupils to the practice of virtue on the one hand, or to deter them from indulging vicious paſſions on the other. It reſembled opening heaven and hell to a hardened ſinner. The practices inculcated in celebrating the myſteries are too numerous to be detailed in this imperfect ſketch. The worſhip of the gods was ſtrictly enjoined, as has been ſhown above. The three laws generally aſcribed to Triptolemus were inculcated, 1. To honour their parents; 2. To honour the gods with the firſt fruits of the earth; 3. Not to treat brute animals with cruelty. Theſe laws were imported from Egypt, and were communicated to the Eleuſinians by the original miſſionaries. Cicero makes the civilization of mankind one of the moſt beneficial effects of the Eleuſinian inſtitutions: "Nullum mihi, cum multa eximia divinaque videntur Athenæ tuæ peperiſſe; tum nihil melius illus myſteriis, quibus ex agreſti immanique vita, exculti ad humanitatem, et mitigati ſumus; inatiaque, ut appellantur, ita revera principia vitæ cognovimus; neque ſolum cum lectitia vivendi rationem acceppimus, ſed etiam cum ſpe meliore moriendi." Hence it is evident, that the precepts of humanity and morality were warmly recommended in theſe inſtitutions. The virtue of humanity was extended, one may ſay, even to the brute creation, as appears from the laſt of Triptolemus's laws above quoted. Some articles were enjoined in the teletæ which may appear to us of leſs importance, which, however, in the ſymbolical ſtyle of the Egyptians, were abundantly ſignificant. The initiated were "commanded to abſtain from the fleſh of certain birds and fiſhes: from beans, from pomegranates and apples, which were deemed equally polluting. It was taught, that to touch the plant of aſparagus was as dangerous as the moſt deadly poiſon. Now, ſays Porphyry, whoever is verſed in the hiſtory of the *viſions*, knows for what reaſon they were commanded to abſtain from the fleſh of birds."

75 The initiated bound themſelves by oaths to obſerve the precepts of the myſteries.

The initiated then bound themſeves by dreadful oaths to obſerve moſt conſcientiouſly and to practiſe every precept tendered to them in the courſe of the teletæ; and at the ſame time never to divulge one article of all that had been heard or ſeen by them upon that occaſion. In this they were ſo exceedingly jealous, that Æſchylus the tragedian was in danger of capital puniſhment for having only alluded to one of the Eleuſinian arcana in a tragedy of his; and one of the articles of indictment again Diagoras the Melian was, his having ſpoken diſreſpectfully of the myſteries, and diſſuaded people from partaking of them. It muſt then be allowed, that the inſtitution of the myſteries was of infinite advantage to the pagan world. They were indeed a kind of ſacraments, by which the initiated bound themſelves by a ſolemn vow to practiſe piety towards the gods, juſtice and humanity towards their fellow-men, and gentleneſs and tenderneſs towards the inoffenſive part of the brute creation. The pagans themſelves were ſo thoroughly convinced of this fact, that in their diſputes with the apologiſts for Chriſtianity, they often appealed to the teletæ, and contraſted their maxims with the moſt ſublime doctrines of that heavenly inſtitution.

76 Horrible ſpectres and pleaſing ſcenes alternately exhibited.

In order to impreſs theſe maxims the more deeply upon the minds of the novices, and to fix their attention more ſtedfaſtly upon the lectures which were delivered them by the myſtagogue or the ſacred herald, a mechanical operation was played off at proper intervals during the courſe of the celebration. "Towards the end of the celebration (ſays Stobæus), the whole ſcene is terrible; all is trembling, ſhuddering, ſweat, and aſtoniſhment. Many horrible ſpectres are ſeen, and ſtrange cries and howlings uttered. Light ſucceeds darkneſs; and again the blackeſt darkneſs the moſt glaring light. Now appear open plains, flowery meads, and waving groves; where are ſeen dances and choruſes; and various holy phantaſies enchant the ſight. Melodious notes are heard from far, with all the ſublime ſymphony of the ſacred hymns. The pupil now is completely perfect, is initiated, becomes free, releaſed, and walks about with a crown on his head, and is admitted to bear a part in the ſacred rites." Ariſtides de Myſt. Eleuſ. calls Eleuſis "a kind of temple of the whole earth, and of all that man beholds done in the moſt dreadful and the moſt exhilerating manner. In what other place have the records of fable ſung of things more marvellous? or in what region upon earth have the objects preſented to the eye bore a more exact reſemblance to the ſounds which ſtrike the ear? What object of ſight have the numberleſs generations of men and women beheld comparable to theſe exhibited in the ineffable myſteries?" To the ſame purpoſe, Pletho, in the oracles of Zoroaſtres, informs us, "that frightful and ſhocking apparitions, in a variety of forms, uſed to be diſplayed to the myſtæ in the courſe of their initiation." And a little after, he adds, "that thunder and lightning and fire, and every thing terrible which might be held ſymbolical of the divine preſence, was introduced." Claudian, in his poem *De Rapta Proſerpina*, gives an elegant though brief, deſcription of this phenomenon, which throws ſome light on the paſſages above quoted.

> "*Jam mihi cernuntur trepidis delubra moveri*
> "*Sedibus et claram diſpergere culmina lucem.*
> "*Adventum teſtata Dea, jam magnus ab imis*
> "*Auditur fremitus terris, templumque remugit*
> "*Cecropidum.*"

The ſight of thoſe appearances was called the *Autopſia*, or "the real preſence:" hence thoſe rites were ſometimes called *Epoptica*. The *Epoptæ* were actually initiated, and were admitted into the *Sanctum Sanctorum*, and bore a part in the ceremonial; whereas the *myſtæ*, who had only been initiated in the leſſer myſteries at Agræ, were obliged to take their ſtation in the porch

77
A kind of baptiſmal ablution in the myſteries.

of the temple. The candidates for initiation bathed themſelves in holy water, and put on new cloaths, all of linen, which they continued to wear till they were quite torn, and then they were conſecrated to Ceres and Proſerpine. From the ceremony of bathing they were denominated *Hydrani*; and this again was a kind of baptiſmal ablution. Whether the phraſes of *waſhing away ſin, putting on the Lord Jeſus Chriſt, putting off the old man with his deeds, putting on a robe of righteouſneſs, being buried in baptiſm*, the words *myſtery, perfect, perfection* which occur ſo frequently in the New Teſtament, eſpecially in the writings of the apoſtle St Paul, are borrowed from the pagan myſteries, or from uſages current among the Jews, we leave to our more learned readers to determine.

78
The initiated declared perfect men.

The Epoptæ having ſuſtained all thoſe fiery trials heard and ſeen every thing requiſite, taken upon them the vows and engagements above narrated, and, in a word, having ſhown themſelves good ſoldiers of Ceres and Proſerpine, were now declared *perfect men*. They might, like Cebes's *virtuous man*, travel wherever they choſe: thoſe wild beaſts (the human paſſions) which tyranniſe over the reſt of mankind, and often deſtroy them, had no longer dominion over them. They were now not only *perfect* but *regenerated* men. They were now crowned with laurel, as was ſaid above, and diſmiſſed with two barbarous words, Κογξ, ὀμπαξ, *Konx ompax*, of which perhaps the Hierophants themſelves did not comprehend the import. They had been introduced by the firſt Egyptian miſſionaries, and retained in the ſacra after their ſignification was loſt. This was a common practice among the Greeks. In the adminiſtration of their religious ceremonies, they retained many names of perſons, places, things, cuſtoms, &c. which had been introduced by the Phœnicians and Egptians, from whom they borrowed their ſyſtem of idolatry. Thoſe terms conſtituted the language of the gods, ſo often mentioned by the prince of poets. To us the words in queſtion appear to be Syriac, and to ſignify, *Be vigilant, be innocent.*

Numerous and important were the advantages ſuppoſed to redound to the initiated, from their being admitted to partake of the myſteries, both in this life and that which is to come. Firſt, they were highly honoured, and even revered, by their contemporaries. Indeed, they were looked up to as a kind of ſacred perſons: they were, in reality, conſecrated to Ceres and Proſerpine. Secondly, they were obliged by their oath to practiſe every virtue, religious, moral, political, public, and private. Thirdly they imagined, that ſound advice and happy meaſures of conduct were ſuggeſted to the initiated by the Eleuſinian goddeſſes. Accordingly, ſays Pericles the celebrated Athenian ſtateſman, "I am convinced, that the deities of Eleuſis inſpired me with this ſentiment, and that this ſtratagem was ſuggeſted by the principal of the myſtic rites." There is a beautiful paſſage in Ariſtophanes's * comedy of the Frogs to the very ſame purpoſe, of which we have made the following periphraſis. It is ſung by the chorus of the initiated.

Let us to flow'ry meads repair,
  With deathleſs roſes blooming,
Whoſe balmy ſweets impregn the air,
  Both hills and dales perfuming.
Since fate benign our choir has join'd,
  We'll trip in myſtic meaſure:
In ſweeteſt harmony combin'd
  We'll quaff full draughts of pleaſure.
For us alone the pow'r of day
  A milder light diſpenſes;
And ſheds benign a mellow'd ray
  To cheer our raviſh'd ſenſes:
For we beheld the myſtic ſhow,
  And brav'd Eleuſis' dangers.
We do and know the deeds we owe
  To neighbours, friends, and ſtrangers.

Euripides, in his Bacchæ (E). introduces the chorus extolling the happineſs of thoſe who had been acquainted with God by participating in the holy myſteries, and whoſe minds had been enlightened by the myſtical rites. They boaſt, "that they had led a holy and unblemiſhed life, from the time that they had been initiated in the ſacred rites of Jupiter Idæus, and from the time that they had relinquiſhed celebrating the nocturnal rites of Bacchus, and the banquets of raw fleſh torn off living animals." To this ſanctity of life they had no doubt engaged themſelves, when they were initiated in the myſteries of that god. The Eleuſinian Epoptæ derived the ſame advantages from their ſacramental engagements. Fourthly, the initiated were imagined to be the peculiar wards of the Eleuſinian goddeſſes. Theſe deities were ſuppoſed to watch over them, and often to avert impending danger, and to reſcue them when beſet with troubles.—Our readers will not imagine that the initiated reaped much benefit from the protection of his Eleuſinian tutelary deities; but it was ſufficient that they believed the fact, and actually depended upon their interpoſition. Fifthly, the happy influences of the teletæ, were ſuppoſed to adminiſter conſolation to the Epoptæ in the hour of diſſolution; for, ſays Iſocrates "Ceres beſtowed upon the Athenians two gifts of the greateſt importance; the fruits of the earth, which were the cauſe of our no longer leading a ſavage courſe of life; and the teletæ, for they who partake of theſe entertain more pleaſant hopes both at the end of life, and eternity afterwards." Another author * tells us, "that the initiated were not only often reſcued from many hardſhips in their lifetime, but at death entertained hopes that they ſhould be raiſed to a more happy condition." Sixthly, After death, in the Elyſian fields, they were to enjoy ſuperior degrees of felicity, and were to baſk in eternal ſunſhine, to quaff nectar, and feaſt upon ambroſia, &c.

79
Intereſtedneſs of the prieſts.

The prieſts were not altogether diſintereſted in this ſalutary proceſs. They made their diſciples believe, that the ſouls of the uninitiated, when they arrived in the infernal regions, ſhould roll in mire and dirt, and with very great difficulty arrive at their deſtined manſion.

* [illegible]

* Ariſtides de M. R. El.

(E) Act I. near the beginning, and in many other places.

‡ Phædo.

ſion. Hence Plato introduces Socrates ‡ obſerving, "that the ſages who inſtituted the teletæ had poſitively affirmed, that whatever ſoul ſhould arrive in the infernal manſions *unhouſel'd* and *unanneal'd*, ſhould lie there immerſed in mire and filth." And as to a future ſtate (ſays Ariſtides), "the initiated ſhall not roll in mire and grope in darkneſs: a fate which awaits the unholy and uninitiated." It is not hard to conceive with what a commanding influence ſuch doctrines as theſe muſt have operated on the generality of mankind.

80
Remarks of Diogenes and Antiſthenes.

When the Athenians adviſed Diogenes to get himſelf initiated, and enforced their arguments with the above conſiderations, "It will be pretty enough (replied the philoſopher) to ſee Ageſilaus and Epaminondas wallowing in the mire, while the moſt contemptible raſcals who have been initiated are ſtrutting in the iſlands of bliſs."

When Antiſthenes was to be initiated in the Orphic myſteries, and the prieſt was boaſting of the many aſtoniſhing benefits which the initiated ſhould enjoy in a future ſtate ‡, "Why, forſooth, (ſays Antiſthenes), 'tis wonder your reverence don't e'en hang yourſelf in order to come at them the ſooner."

† Diog. Laert.

81
All the world crowd to Eleuſis.

When ſuch benefits were expected to be derived from the myſteries, no wonder if all the world crowded to the Eleuſinian ſtandard. After the Macedonian conqueſts, the Hierophants abated much of their original ſtrictneſs. By the age of Cicero, Eleuſis was a temple whether all nations reſorted to partake of the benefits of that inſtitution. We find that almoſt all the great men of Rome were initiated. The Hierophants, however, would not admit Nero on account of the profligacy of his character. Few others were refuſed that honour; even the children of the Athenians were admitted. But this, we think, was rather a luſtration or conſecration, than an initiation. Perhaps it paved the way for the more auguſt ceremony, as the Chriſtian baptiſm does among us for the other ſacrament.

82
Degeneracy of the myſteries.

That this inſtitution gradually degenerated, can hardly be queſtioned; but how much, and in what points, we have not been able to inveſtigate. The fathers of the church, from whom that charge is chiefly to be collected, are not always to be truſted, eſpecially when they ſet themſelves to arraign the inſtitutions of Paganiſm There were indeed ſeveral ancient authors, ſuch as Melanthius, Menander, Sotades, &c. who wrote purpoſely on the ſubject in queſtion, but their works are long ſince irrecoverably loſt. For this reaſon, modern writers, who have profeſſedly handled it have not always been ſucceſsful in their reſearches. The two who have laboured moſt indefatigably, and perhaps moſt ſucceſsfully, in this field, are Meurſius and Warburton. The former, in his *Liber Singularis*, has collected every thing that can be gleaned from antiquity relating to the ceremonial of theſe inſtitutions, without, however, pointing out their orignal, or elucidating the end and import of their eſtabliſhment. The latter has drawn them into the vortex of a ſyſtem which has in many inſtances led him to aſcribe to them a higher degree of merit than we think they deſerve. Theſe inſtances we would willingly have noticed in our progreſs, had the limits preſcribed us admitted ſuch a diſcuſſion

If we may believe Diodorus the Sicilian, theſe myſteries, which were celebrated with ſuch wonderful ſecrecy at Eleuſis, were communicated to all mankind among the Cretans. This, however, we think, is rather problematical. We imagine that excellent hiſtorian has confounded the myſteries of Cybele with thoſe of the Eleuſinian Ceres. Theſe two deities were undoubtedly one and the ſame, that is, the moon or the earth. Hence it is probable, that there was a ſtriking reſemblance between the ſacred myſteries of the Cretans and Eleuſinians.

This inſtitution continued in high reputation to the age of St Jerome, as appears from the following paſſage; "Hierophantæ quoque Athenienſium legant uſque hodie cicutæ ſorbitione caſtrari." The emperor Valentinianus intended to have ſuppreſſed them; but Zozimus ‡, informs us, that he was diverted from his deſign by the proconſul of Greece. At length Theodoſius the elder, by an imperial edict prohibited the celebration of theſe as well as of all the other ſacra of Paganiſm. Theſe myſteries, inſtituted in the reign of Erectheus, maintained their ground to the period juſt mentioned, that is, near 2000 years; during which ſpace, the celebration of them never had been interrupted but once. When Alexander the Great maſſacred the Thebans and razed their city, the Athenians were ſo much affected with this melancholy event, that they neglected the celebration of that feſtival.

‡ Adverſ. Jovin.

83
Aboliſhed by the emperor Theodoſius.

84
Other myſteries among the pagans of leſs celebrity.

There were almoſt numberleſs other myſterious inſtitutions among the ancient Pagans, of which theſe ſketched above were the moſt celebrated. The Samothracian myſteries, inſtituted in honour of the Cabiri, were likewiſe of conſiderable celebrity, and were ſuppoſed to confer much the ſame bleſſing with the Eleuſinian, but were not of equal celebrity. The Cabiri were Phœnician and likewiſe Egyptian ‡ deities. The learned Bochart has explained their origin, number, names and ſome part of their worſhip. The Orphic myſteries were likewiſe famous among the Thracians. Orpheus learned them in Egypt, and they were nearly the ſame with the ſacra Bacchanalia of the Greeks. There were likewiſe the myſteries of Jupiter Idæus in great requeſt among the Cretans, thoſe of the Magna Mater or Cybele, celebrated in Phrygia. To enumerate and detail all theſe would require a complete volume. We hope our readers will be fully ſatisfied with the ſpecimen exhibited above. We are convinced many things have been omitted which might have been inſerted, but we have collected the moſt curious and the moſt important.—Every one of the poſitions might have been authenticated by quotations from authors of the moſt undoubted credibility, but that proceſs would have ſwelled the the article beyond all proportion.

‡ Sanchoniathon and Herodotus.

Myſtical, Myſtics.

MYSTICAL, ſomething myſterious or allegorical. Some of the commentators on the ſacred writings, beſides a literal find alſo a myſtical meaning. The ſenſe of ſcripture, ſay they, is either that immediately ſignified by the words and expreſſions in the common uſe of language; or it is mediate, ſublime, typical, and myſtical. The literal ſenſe they again divide into proper literal, which is contained in the words taken ſimply and properly; and metaphorical literal, where the words are to be taken in a figurative and metaphorical ſenſe. The myſtical ſenſe of ſcripture they divide into three kinds: the firſt correſponding to faith, and called *allegorical;* the ſecond to hope, called *anagogical;* and the third to charity, called the *tropological ſenſe.* And ſometimes they take the ſame word in ſcripture in all the four ſenſes: thus the word *Jeruſalem,* literally ſignifies the capital of Judea: allegorically, the church militant: tropologically, a believer; and anagogically, heaven. So that paſſage in Geneſis, *let there be light and there was light,* literally ſignifies corporeal light: by an allegory, the Meſſiah in the tropological ſenſe, grace; and anagogically, beatitude, or the light of glory.

MYSTICS, *myſtici,* a kind of religious ſect, diſtinguiſhed by their profeſſing pure, ſublime, and perfect devotion, with an entire diſintereſted love of God, free from all ſelfiſh conſiderations.

The myſtics, to excuſe their fanatic ecſtacies and amorous extravagancies, alledge that paſſage of St Paul, *The Spirit prays in us by ſighs and groans that are unutterable.* Now if the Spirit, ſay they, pray in us, we muſt reſign ourſelves to its motions, and be ſwayed and guided by its impulſe, by remaining in a ſtate of mere inaction.

Paſſive contemplation is that ſtate of perfection to which the myſtics all aſpire.

The authors of this myſtic ſcience, which ſprung up towards the cloſe of the third century, are not known; but the principles from which it was formed are manifeſt. Its firſt promoters preceded from the known doctrine of the Platonic ſchool, which was alſo adopted by Origen and his diſciples, that the divine nature was diffuſed through all human ſouls, or that the faculty of reaſon, from which proceed the health and vigour of the mind, was an emanation from God into the human ſoul, and comprehended in it the principles and elements of all truth, human and divine. They denied that men could by labour or ſtudy excite this celeſtial flame in the breaſt; and therefore they diſapproved highly of the attempts of thoſe, who by definitions, abſtract theorems, and profound ſpeculations, endeavoured to form diſtinct notions of truth, and to diſcover its hidden nature. On the contrary, they maintained that ſilence, tranquility, repoſe, and ſolitude, accompanied with ſuch acts as might tend to extenuate and exhauſt the body, were the means by which the hidden and internal word was excited to produce its latent virtues, and to inſtruct men in the knowledge of divine things. For thus they reaſoned; thoſe who behold with a noble contempt all human affairs, who turn away their eyes from terreſtrial vanities, and ſhut all the avenues of the outward ſenſes againſt the contagious influences of a material world, muſt neceſſarily return to God, when the ſpirit is thus diſengaged from the impediments that prevented that happy union. And in this bleſſed frame they not only enjoy inexpreſſible raptures from their communion with the Supreme Being, but alſo are inveſted with the ineſtimable privilege of contemplating truth undiſguiſed and uncorrupted in its native purity, while others behold it in a vitiated and deluſive form.

Myſtics || Mytens.

The number of the Myſtics increaſed in the fourth century, under the influence of the Grecian fanatic, who gave himſelf out for Dionyſius the Areopagite, diſciple of St Paul, and probably lived about this period: and by pretending to higher degrees of perfection than other Chriſtians, and practiſing greater auſterity, their cauſe gained ground, eſpecially in the eaſtern provinces, in the fifth century. A copy of the pretended works of Dionyſius was ſent by Balbus to Lewis the Meek in the year 824, which kindled the holy flame of myſticiſm in the weſtern provinces, and filled the Latins with the moſt enthuſiaſtic admiration of this new religion.

In the twelfth century, theſe myſtics took the lead in their method of expounding ſcripture; and by ſearching for myſteries and hidden meaning in the plaineſt expreſſions, forced the word of God into a conformity with their viſionary doctrines, their enthuſiaſtic feelings, and the ſyſtem of diſcipline which they had drawn from the excurſions of their irregular fancies. In the thirteenth century, they were the moſt formidable antagoniſts of the ſchoolmen, and towards the cloſe of the fourteenth, many of them reſided and propagated their tenets almoſt in every part of Europe. They had, in the fifteenth century, many perſons of diſtinguiſhed merit in their number; and in the ſixteenth century, previous to the reformation, if any ſparks of real piety ſubſiſted under the deſpotic empire of ſuperſtition, they were only to be found among the myſtics.

The principles of this ſect were adopted by thoſe called *Quietiſts* in the ſeventeenth century, and, under different modifications, by the Quakers and Methodiſts.

MYSTRUM, a liquid meaſure among the ancients, containing the fourth part of the Cyathus, and weighing two drams and an half of oil, or two drams two ſcruples of water or wine. It nearly anſwers to our ſpoonful.

MYTELENE See Metylene.

MYTENS (Daniel), of the Hague, was an admired painter in the reigns of king James and king Charles. He had certainly (Mr Walpole ſays) ſtudied the works of Rubens before his coming over. His landſcape in the back grounds of his portraits is evidently in the ſtyle of that ſchool; and ſome of his works have been taken for Vandyck's. The date of his arrival is not certain. At Hampton-court are ſeveral whole lengths of princes and princeſſes of the houſe of Brunſwick-Lunenburgh, and the portrait of Charles Howard earl of Nottingham; at Kenſington is Mytens's own head. At Knowle, Lionel Cranfield earl of Middleſex, lord treaſurer, with his white ſtaff, whole length. At Lady Elizabeth Germain's at Drayton is a very fine whole length of Henry Rich earl of Holland, in a ſtriped habit, with a walking ſtick. At St James's is Jeffery Hudſon the dwarf, holding a dog by a ſtring, in a landſcape, coloured warmly and freely like Snyder or Rubens. Mytens drew the ſame figure in a very large picture of Charles I. and his

Queen, which was in the poſſeſſion of the late earl of Dunmore. The picture of the queen of Scots at St James's is a copy by Mytens. Mytens remained in great reputation till the arrival of Vandyck, who being appointed the king's principal painter, the former in diſguſt aſked his Majeſty's leave to retire to his own country; but the king learning the cauſe of his diſſatisfaction treated him with much kindneſs, and told him that he could find ſufficient employment both for him and Vandyck. Mytens conſented to ſtay, and even grew intimate, it is probable, with his rival, for the head of Mytens is one of thoſe painted among the profeſſors by that great maſter. Whether the ſame jealouſy operated again, or real decline of buſineſs influenced him, or any other cauſe, Mytens did not ſtay much longer in England. We find none of his works here after the year 1630. Yet he lived many years afterwards. Houbraken quotes a regiſter at the Hague dated in 1656, at which time it ſays Mytens painted part of the ceiling of the town-hall there; the ſubject is, Truth writing hiſtory on the back of Fame.

MYTENS (Martin), painter of portraits and hiſtory, was born at Stockholm in 1695, and at 11 years of age ſhowed an extraordinary genius. When he had practiſed for ſome years, he determined to ſeek for improvement at Rome, and in his progreſs to examine every thing curious in other cities of Europe. His firſt excurſion was to Holland, and from thence he proceeded to London, where he practiſed minature and enamel painting, to which he had always a ſtrong tendency, and by his performances in that way gained a ſufficiency to maintain himſelf, without being any incumbrance to his parents. In 1717 he viſited Paris, and proved ſo fortunate as to obtain the favour of the duke of Orleans, and to have the honour to paint the portrait of that prince, and alſo the portraits of Louis XV. and the Czar Peter. In 1721 he arrived at Vienna, where he was graciouſly received; and having with great applauſe painted the portraits of the emperor, the empreſs, and the moſt illuſtrious perſons at that court, during a reſidence of above two years, he proceeded on his intended journey to Italy. Having viſited Venice and ſpent two years at Rome, he went to Florence, where the grand duke Gaſton I. ſhowed him all poſſible marks of eſteem; and having engaged him for ſome time in his ſervice he made him conſiderable preſents, and placed the portrait of Mytens among the heads of the illuſtrious artiſts in his gallery. He alſo received public teſtimonies of favour from the king and queen of Sweden, each of them having preſented him with a chain of gold and a medal, when he viſited that court, after his return from Italy. At laſt he ſettled at Vienna, where he obtained large appointments from the court; and lived univerſally eſteemed for his uncommon merit, and equally valued for his perſonal accompliſhments. He died in 1755.

There were ſome other painters of the name of *Mytens*, but of inferior note.

MYTHOLOGY.

1
Definition.

IS a term compounded of two Greek words, and in its original import it ſignifies any kind of fabulous doctrine: In its more appropriated ſenſe, it means thoſe fabulous details concerning the objects of worſhip which were invented and propagated by men who lived in the early ages of the world, and by them tranſmitted to ſucceding generations, either by written records or by oral tradition.

As the theology and mythology of the ancients are almoſt inſeparably connected, it will be impoſſible for us to develope the latter, without often introducing ſome obſervations relating to the former. We muſt therefore intreat the indulgence of our readers, if upon many occaſions we ſhould hazard a few ſtrictures on the names, characters, adventures, and functions of ſuch pagan divinities as may have furniſhed materials for thoſe fabulous narrations which the nature of the ſubject may lead us to diſcuſs.

2
Origin of fable.

With reſpect to *fable*, it may be obſerved in general, that it is a creature of the human imagination, and derives its birth from that love of the *marvellous* which is in a manner congenial to the ſoul of man.—The appearances of nature which every day occur, objects, actions, and events, which ſucceed each other, by a kind of rotine, are too familiar, too obvious, and unintereſting, either to gratify curioſity or to excite admiration. On the other hand, when the moſt common phenomena in nature or life are new modelled by the plaſtic power of a warm imagination: when they are diverſified, compounded, embelliſhed, or even arranged and moulded into forms which ſeldom or perhaps never occur in the ordinary courſe of things;—novelty generates admiration, a paſſion always attended with delightful ſenſations. Here then we imagine we have diſcovered the very ſource of *fiction* and *fable*.—They originated from that powerful propenſity in our nature towards the *new* and *ſurpriſing*, animated by the delight with which the contemplation of them is generally attended.

Many circumſtances contributed to extend and eſtabliſh the empire of fable. The legiſlator laid hold on this bias of human nature, and of courſe employed *fable* and *fiction* as the moſt effectual means to civilize a rude, unpoliſhed world. The philoſopher, the theologiſt, the poet, the muſician, each in his turn, made uſe of this vehicle to convey his maxims and inſtructions to the ſavage tribes. They knew that *truth*, ſimple and unadorned, is not poſſeſſed of charms powerful enough to captivate the heart of man in his preſent corrupt and degenerate ſtate. This conſideration, which did indeed reſult from the character of their audience, naturally led them to employ fiction and allegory from this was derived the allegorical taſte of the ancients, and eſpecially of the primary ſages of the eaſt.

Though almoſt every nation on the face of the globe, however remote from the centre of population, however ſavage and averſe from cultivation, has fabricated

3
Boldneſs of the oriental mythology.

and adopted its own ſyſtem of mythology; the Orientals, however, have diſtinguiſhed themſelves in a peculiar manner, by the boldneſs, the inconſiſtency, and the extravagance of their mythology. The genial warmth of thoſe happy climes, the fertillity of the ſoil, which afforded every neceſſary, every conveniency, and often every luxury of life, without depreſſing their ſpirits by laborious exertions; the face of nature perpetually blooming around them, the ſkies ſmiling with uninterrupted ſerenity; all contributed to inſpire the orientals with a glow of fancy and a vigour of imagination rarely to be met with in leſs happy regions. Hence every object was ſwelled beyond its natural dimenſions. Nothing was great or little in moderation, but every ſentiment was heightened with incredible hyperbole. The magnificent the ſublime, the vaſt, the enormous, the marvellous, firſt ſprung up, and were brought to maturity, in thoſe native regions of fable and fairyland. As nature in the ordinary courſe of her operations, exhibited neither objects nor effects adequate to the extent of their romantic imaginations, they naturally deviated into the fields of fiction and fable. Of conſequence, the cuſtom of detailing fabulous adventures originated in the eaſt, and was from thence tranſplanted into the weſtern countries.

As the allegorical taſte of the eaſtern nations had ſprung from their propenſity to fable, and as that propenſity had in its turn originated from the love of the marvellous; ſo did allegory in proceſs of time contribute its influence towards multiplying fables and fiction almoſt *in infinitum*. The latent import of the allegorical doctrines being in a few ages loſt and obliterated, what was originally a moral or theological tenet, aſſumed the air and habit of a perſonal adventure.

4
Propenſity to perſonification a ſource of eaſtern mythology.

The propenſity towards perſonification, almoſt univerſal among the orientals, was another fruitful ſource of fable and allegory, That the people of the eaſt were ſtrongly inclined to perſonify inanimate objects and abſtract ideas, we imagine will be readily granted, when it is conſidered, that in the formation of language they have generally annexed the affection of ſex to thoſe objects. Hence the diſtinction of grammatical genders, which is known to have originated in the eaſtern parts of the world. The practice of perſonifying virtues, vices, religious and moral affections, was neceſſary to ſupport that allegorical ſtyle which univerſally prevailed in thoſe countries. This mode of writing was in high reputation even in Europe ſome centuries ago; and to it we are indebted for ſome of the moſt noble poetical compoſitions now extant in every modern language. Theſe productions, however, are but faint imitations of the original mode of writing ſtill current among the eaſtern nations. The Europeans derived this ſpecies of compoſition from the Mooriſh inhabitants of Spain, who imported it from Arabia, their original country.

5
The effects of hieroglyphic writing on mythology.

The general uſe of hieroglyphics in the eaſt, muſt have contributed largely towards extending the empire of mythology. As the the import of the figures employed in this method of delineating the ſigns of ideas was in a great meaſure arbitrary, miſtakes muſt have been frequently committed in aſcertaining the notion which they were at the firſt intended to repreſent. When the developement of theſe arbitrary figures happened to be attended with uncommon difficulty, the expounders were obliged to have recourſe to conjecture. Thoſe conjectural expoſitions were for the moſt part tinctured with that bias towards the marvellous which univerſally prevailed among the primitive men. This we find is the caſe even at this day, when moderns attempt to develope the import of emblematical figures, preſerved on ancient medals, intaglions, &c.

The wiſe men of the eaſt delighted in obſcure enigmatical ſentences. They ſeem to have diſdained every ſentiment obvious to vulgar apprehenſion. The words of the wiſe, and their dark ſayings, often occur in the moſt ancient records both ſacred and prophane. The ſages of antiquity uſed to vie with each other for the prize of ſuperior wiſdom, by propounding riddles, and dark and myſterious queſtions, as ſubjects of inveſtigation. The conteſt between Solomon and Hiram, and that between Amaſis king of Egypt and Polycrates tyrant of Samos, are univerſally known.—As the import of thoſe enigmatical propoſitions was often abſolutely loſt, in ages when the art of writing was little known, and ſtill leſs practiſed, nothing remained but fancy and conjecture, which always verged towards the regions of fable. This then, we think, was another ſource of mythology.

6
Mythology reduced to a kind of ſyſtem in Egypt.

The Pagan prieſts, eſpecially in Egypt, were probably the firſt who reduced mythology to a kind of ſyſtem. The ſacerdotal tribe, among that people, were the grand depoſitaries of learning as well as of religion. That order of men monopoliſed all the arts and ſciences. They ſeem to have formed a conſpiracy among themſelves, to preclude the laity from all the avenues of intellectual improvement. This plan was adopted with a view to keep the laity in ſubjection, and to enhance their own importance. To accompliſh this end, they contrived to perform all the miniſtrations of their religion in an unknown tongue, and to cover them with a thick veil of fable and allegory. The language of Ethiopia became their ſacred dialect, and hieroglyphics their ſacred character.—Egypt, of courſe, became a kind of fairyland, where all was jugglery, magic, and enchantment. The initiated alone were admitted to the knowledge of the occult myſtical exhibitions, which, in their hands, conſtituted the eſſence of their religion. From theſe the vulgar and profane were prohibited by the moſt rigorous penalties (See MYSTERIES). The Egyptians, and indeed all the ancients without exception, deemed the myſteries of religion too ſacred and ſolemn to be communicated to the herd of mankind, naked and unreſerved; a mode by which they imagined thoſe ſacred and ſublime oracles would have been defiled and degraded. "Procul. o procul eſte profani—Odi profanum vulgus et arceo." Egypt was the land of graven images; allegory and mythology were the veil which concealed religion from the eyes of the vulgar; fable was the groundwork of that impenetrable covering.

7
In the earlieſt ages of the world mythology had no exiſtence.

In the earlieſt and moſt unpoliſhed ſtage of ſociety we cannot ſuppoſe fable to have exiſted among men. Fables are always *tales of other times*, but at this period other times did not reach far enough backward to afford theſe fruits of the imagination ſufficient time to arrive at maturity. Fable requires a conſiderable ſpace of time to acquire credibility, and to riſe into reputation. Accordingly, we find that both the Chineſe and Egyptians, the two moſt ancient nations whoſe annals have reached our times, were altogether unacquainted with fabulous details in the moſt early and leaſt improved periods of their reſpective monarchies. It has been ſhown almoſt to a demonſtration, by a variety of learned men, that both the one and the other people, during ſome centuries after the general deluge, retained and practiſed the primitive Noachic religion, in which fable and fancy could find no place; all was genuine unſophiſticated truth.

8 Fabulous coſmogonies, the firſt mythological details.

As ſoon as the authentic tradition concerning the origin of the univerſe was either in a great meaſure loſt, or at leaſt adulterated by the inventions of men, fable and fiction began to prevail. The Egyptian *Thoth* or Thyoth, or Mercury Triſmegiſtus, and Mochus the Phœnician, undertook to account for the formation and arrangement of the univerſe, upon principles purely mechanical. Here fable began to uſurp the place of genuine hiſtorical truth. Accordingly, we find that all the hiſtorians of antiquity, who have undertaken to give a general detail of the affairs of the world, have uſhered in their narration with a fabulous coſmogony. Here imagination ranged unconfined over the boundleſs extent of the primary chaos. To be convinced of the truth of this aſſertion, we need only look into Sanchoniathon's Coſmogony, Euſeb. Præp. Evan. l. 1. ſub init. and Diodorus Sic. l. 1. From this we ſuppoſe it will follow, that the firſt race of fables owed their birth to the erroneous opinions of the formation of the univerſe.

Having now endeavoured to point out the origin of mythology, or fabulous traditions, we ſhall proceed to lay before our readers a brief detail of the mythology of the moſt reſpectable nations of antiquity, following the natural order of their ſituation.

9 Chineſe mythology.

The Chineſe, if any credit be due to their own annals, or to the miſſionaries of the church of Rome, who pretend to have copied from them, were *the firſt of the nations*. Their fabulous records reach upwards many myriads of years before the Moſaic æra of the creation. The events during that period of time, if any had been recorded, muſt have been fabulous as the period itſelf. Theſe, however, are buried in eternal oblivion. The miſſionaries, who are the only ſources of our information with relation to the earlieſt periods of the Chineſe hiſtory, repreſent thoſe people as having retained the religion of Noah many centuries after the foundation of their empire. Upon this ſuppoſition, their coſmogony muſt have been ſound and genuine, without the leaſt tincture of thoſe fabulous ingredients which have both diſguiſed and diſgraced the coſmogonies of moſt other nations.

10 Birth and inventions of Fohi.

According to the moſt authentic accounts, *Fohe* or *Fohi* laid the foundation of that empire about 4000 years ago. This emperor, according to the Chineſe, was conceived in a miraculous manner. His mother, ſay they, one day as ſhe was walking in a deſert place, was ſurrounded by a rainbow; and, being impregnated by this meteor, was in due time delivered of that celebrated legiſlator. This perſonage, like the Athenian Cecrops, was half a man and half a ſerpent. His intellectual powers were truly hyperbolical. In one day he diſcovered 50 different ſpecies of poiſonous herbs. He taught his countrymen the whole art of agriculture in the ſpace of a very few years. He inſtructed them how to ſow five different ſorts of grain. He invented boats and nets for fiſhing, the art of baking porcelain, the management of ſilk-worms, the manufacturing of ſilk, &c. In a word, this wonderful perſonage was inſpired by Heaven with knowledge, which qualified him for compoſing that incomparable body of laws which are even at this day the wonder of the world. Our readers will admit, that this whole detail is fabulous and chimerical. The moſt learned part of them will readily obſerve, that the Chineſe, in aſcribing the invention of all the uſeful arts to their Fohi, are perfectly agreed with almoſt all the other nations of antiquity. The Indians aſcribe every invention to *Budha*, or *Viſtnou*, or *Fo*; the Perſians to *Zerduſht* or *Zoroaſtres*; the Chaldeans to their man of the ſea, whom they call *Oannes*; the Egyptians to *Thoth* or *Thyoth*; the Phœnicians to *Melicerta*; the Greeks to the family of the *Titans*; and the Scandinavians to *Odin*, &c.

11 Miraculous birth of Confucius.

About 55 years before the Chriſtian æra, appeared the famous Chineſe philoſopher *Con-fu-tſe*, or Confucius. Concerning the birth of this prince of philoſophers, the Chineſe have propagated the following legendary tale. His mother walking in a ſolitary place was impregnated by the vivifying influence of the heavens. The babe, thus produced, ſpake and reaſoned as ſoon as it was born. Confucius, however, wrought no miracles, performed no romantic exploits, but lived an auſtere aſcetic life, taught and inculcated the doctrines of pure morality, and died, remarkable only for ſuperior wiſdom, religious, moral, and political.

12 Lao-kiun and his doctrines.

About the year of Chriſt 601. flouriſhed the Sectary *Lao-kiun*. His mother carried him 30 years in her womb, and was at laſt delivered of him under a plum tree. This philoſopher was the Epicurus of the Chineſe. His diſciples, who were denominated *Tao-ſſe*, i. e. heavenly doctors, were the firſt who corrupted the religion of the Chineſe. They were addicted to magic, and introduced the worſhip of good and bad dæmons. Their doctrine was embraced by a long ſucceſſion of emperors. One of theſe princes, called *Vou-ti*, had been deprived by death of a favourite miſtreſs, whom he loved with the moſt extravagant paſſion. The emperor, by the magical ſkill of one of theſe doctors, obtained an interview with his deceaſed miſtreſs, a circumſtance which rivetted the whole order in the affection and eſteem of the deluded prince. Here our reader will obſerve the exact counterpart of the fablé of Eurydice, ſo famous in the mythology of the Greeks and Romans. That ſuch a ſyſtem of religious principles muſt have abounded with mythological adventures is highly probable; but as the miſſionaries, to whom we are chiefly indebted for our information relating to the religion of the Chineſe, have not taken the pains to record them, we find it impoſſible to gratify the curioſity of our readers on that head.

13 [illegible] worſhip of [illegible]

The worſhip of the idol Fo, or Foe, was tranſplanted from India into China about the 65th year of the Chriſtian æra, upon the following occaſion. One of the doctors of the Tao-ſſe had promiſed a prince of the family of Tchou, and brother of the emperor Ming-ti, to make him enter into converſation with the ſpirits. At his ſolicitation an ambaſſador was diſpatched into India, in order to inquire where the true r[illegible] gion was to be found. There had been a tradition, ſay the miſſionaries, ever ſince the age of Confucius, that the true religion was to be found in the weſt — The ambaſſador ſtopt ſhort in India: and finding that the god Foe was in high reputation in that country, he collected ſeveral images of that deity painted on chintz, and with it 42 chapters of the canonical books of the Hindoos, which, together with the images, he laid on a white elephant, and tranſported into his native country. At the ſame time he imported from the ſame quarter the doctrine of the tranſmigration of ſouls, which is firmly believed in China to this day. The doctrine and worſhip of Foe, thus introduced, made a moſt rapid progreſs all over China, Japan, Siam, &c. The prieſts of Foe are called among the Siameſe, *Talopoins*; by the Tartars, *Lamas*; by the Chineſe, *Ho-chang*; and by the people of Japan, *Bonzes*, By this laſt appellation they are generally known in Europe.

14 The worſhippers of Foe great mythologiſts.

An infinitude of fable was invented and propagated by the diſciples of Foe, concerning the life and adventures of their maſter. If the earlier ages of the Chineſe hiſtory are barren of mythological incidents, the later periods, after the introduction of the worſhip of Foe, furniſhed an inexhauſtible ſtore of miracles, monſters, fables, intrigues, exploits, and adventures, of the moſt villainous complexion. Indeed, moſt of them are ſo abſurd, ſo ridiculous, and at the ſame time ſo impious and profane, that we are convinced our readers will eaſily diſpenſe with a detail from which they could reap neither entertainment nor inſtruction. Such as may find themſelves diſpoſed to rake into this abominable puddle, we muſt refer to the reverend fathers du Halde, Couplet, Amiot, Kircher, and other members of the propaganda, in whoſe writings they will find wherewithal to ſatisfy, and even to ſurfeit, their apetite.

15 Hindoo mythology.

The Hindoos, like the other nations of the eaſt, for a long time retained the worſhip of the true God. At length, however, idolatry broke in, and, like an impetuous torrent, overwhelmed the country. Firſt of all, the genuine hiſtory of the origin of the univerſe was either utterly loſt, or diſguiſed under a variety of fictions and allegories. We are told that *Brimha*, the ſupreme divinity of the Hindoos, after three ſeveral efforts, at laſt ſuceeeded in creating four perſons, whom he appointed to rule over all the inferior creatures.— Afterwards Brimha joined his efficient power with Biſhon and Rulder; and by their united exertions they produced ten men, whoſe general appellation is *Munies*, that is, the inſpired. The ſame being, according to another mythology, produced four other perſons, as imaginary as the former; one from his breaſt, one from his back, one from his lip, and one from his heart. Theſe children were denominated *Bangs*; the import of which word we cannot pretend to determine. According to another tradition, Brimha produced the Bramins from his mouth, to pray, to read, to inſtruct; the Chiltern from his arms, to draw the bow, to fight, to govern; the Bice from his belly or thighs, to nouriſh, to provide the neceſſaries of life by agriculture and commerce; the Soder from his feet, for ſubjection to ſerve, to labour, to travel. The reader will ſee at once, in theſe allegorical perſons, the four caſts or ſepts into which the Hindoo nation has, time immemorial, been divided. Theſe are ſome of their moſt celebrated mythological traditions with relation to the origin of the univerſe.

16 Hindoo tradition, relating to the deluge, &c.

The Hindoos have likewiſe ſome mythological opinions which ſeem to relate to the general deluge. They tell us, that deſiring the preſervation of herds and of brahmans, of genii and of virtuous men, of *vedas* of law, and of precious things, the Lord of the univerſe aſſumes many bodily ſhapes; but though he pervades, like the air, a variety of beings, yet he is himſelf unvaried, ſince he has no quality in him ſubject to change. At the cloſe of the laſt *calpa*, there was a general deſtruction, occaſioned by the ſleep of Brahme, whence his creatures in different worlds were drowned in a vaſt ocean. Brahme being inclined to ſlumber after a lapſe of ſo many ages, the ſtrong dæmon *Hayagri va* came near him, and ſtole the *vedas* which had flowed from his lips. When *Heri*, the preſerver of the univerſe, diſcovered this deed of the prince of *Dainavas*, he took the ſhape of a minute fiſh called *Sap-hari*. After various transformations, and an enormous increaſe of ſize in each of them, the Lord of the univerſe loving the righteous man (A), who had ſtill adhered to him under all theſe various ſhapes, and intending to preſerve him from the ſea of deſtruction cauſed by the depravity of the age, thus told him how he was to act: "In ſeven days from the preſent time, O thou Tamer of enemies! the three worlds will be plunged in an ocean of death; but in the midſt of the deſtroying waves a large veſſel ſent by me for thy uſe ſhall ſtand before thee." The remaining part of the mythology ſo nearly reſembles the Moſaic hiſtory of Noah and the general deluge, that the former may be a ſtrong confirmation of the truth of the latter. To dry up the waters of the deluge, the power of the Deity deſcends in the the form of a *boar*, the ſymbol of ſtrength, to draw up and ſupport on his tuſks the whole earth, which had been ſunk beneath the ocean. Again, the ſame power is repreſented as a tortoiſe ſuſtaining the globe, which had been convulſed by the violent aſſaults of dæmons, while the gods churned the ſea with the mountain *Mandar*, and forced it to diſgorge the ſacred things and animals, together with the water of life which it had ſwallowed. All theſe ſtories, we think relate to the ſame event, ſhadowed by a moral, a metaphyſical, and an aſtronomical allegory; and all three ſeem connected with the hieroglyphical ſculptures of the old Egyptians.

The Hindoos divide the duration of the world into four *Yugs* or *Jugs*, or *Jogues*, each conſiſting of a prodigious number of years. In each of thoſe periods, the age and ſtature of the human race have been gradually diminiſhed; and in each of them mankind has gradually declined in virtue and piety, as well as in age and ſtature. The preſent period they call the *Collæ*, i. e. the corrupt Jogue, which they ſay is to laſt 400,000

(A) He was Sovereign of the world. His name was *Manu*, or Statgavrata; his patronymic name was *Vaiſvata* or child of the Sun.

400,000 years, of which near 5000 years are already paſt. In the laſt part of the preceding Jogue, which they call the *Dwa paar*, the age of man was contracted into 1000 years, as in the preſent it is confined to 100. From this proportional diminution of the length of the human life, our readers will probably infer, that the two laſt Jogues bear a pretty near reſemblance to the Moſaic hiſtory of the age of the antediluvian and poſtdiluvian patriarchs; and that the two firſt are imaginary periods prior to the creation of the world, like thoſe of the Chineſe, Chaldeans, and Egyptians.

17 The world ſubject to various diſſolutions and reſuſcitations.

According to the mythology of the Hindoos the ſyſtem of the world is ſubject to various diſſolutions and reſuſcitations. At the concluſion of the Collæ Jogue, ſay they, a grand revolution will take place, when the ſolar ſyſtem will be conſumed by fire, and all the elements reduced to their original conſtituent atoms. Upon the back of theſe revolutions, Brimha, the ſupreme deity of the Hindoos, is ſometimes repreſented as a new born infant, with his toe in his mouth, floating on a camala or water flower, ſometimes only on a leaf, of that plant, on the ſurface of the vaſt abyſs. At other times he is figured as coming forth of a winding ſhell; and again as blowing up the mundane foam with a pipe at his mouth. Some of theſe emblematical figures and attitudes, our learned readers will probably obſerve, nearly reſemble thoſe of the ancient Egyptians.

But the vulgar religion of the ancient Hindoos was of a very different complexion; and opens a large field of mythological adventures. We have obſerved above, that the Fo or Foe of the Chineſe was imported from India; and now we ſhall give a brief detail of the mythological origin of that divinity. We have no certain account of the birth-place of this imaginary deity.—

18 Birth, &c. of the god Fo.

His followers relate, that he was born in one of the kingdoms of India near the line, and that his father was one of that country. His mother brought him into the world by the left ſide, and expired ſoon after her delivery. At the time of her conception, ſhe dreamed that ſhe had ſwallowed a white elephant; a circumſtance which is ſuppoſed to have given birth to the veneration which the kings of India have always ſhown for a white animal of that ſpecies. As ſoon as he was born, he had ſtrength enough to ſtand erect without aſſiſtance. He walked abroad at ſeven, and pointing with one hand to the heavens, and with the other to the earth, he cried out, "In the heavens, and on the earth there is no one but me who deſerves to be honoured." At the age of 30, he felt himſelf all on a ſudden filled with the divinity; and now he was metamorphoſed into Fo or Pagod, according to the expreſſion of the Hindoos. He had no ſooner declared himſelf a divinity, than he thought of propagating his doctrine, and proving his divine miſſion by miracles. The number of his diſciples was immenſe; and they ſoon ſpread his dogmas over all India, and even to the higher extremities of Aſia.

19 Doctrines of Fo derived from Egypt.

One of the principle doctrines which Fo and his diſciples propagated, was the metempſychoſis or tranſmigration of ſouls. This doctrine, ſome imagine, has given riſe to the multitude of idols reverenced in every country where the worſhip of Fo is eſtabliſhed. Quadrupeds, birds, reptiles, and the vileſt animals, had temples erected for them becauſe, ſay they, the ſoul of the god, in his numerous tranſmigrations, may have at one time or other inhabited their bodies.

Both the doctrine of tranſmigration and of the worſhip of animals ſeems, however, to have been imported from Egypt into India. If the intercourſe between theſe two countries was begun at ſo early a period as ſome very late writers have endeavoured to prove, ſuch a ſuppoſition is by no means improbable. The doctrine of the tranſmigration of ſouls was early eſtabliſhed among the Egyptians. It was, indeed, the only idea they formed of the ſoul's immortality. The worſhip of animals among them ſeems to have been ſtill more ancient. If ſuch an intercourſe did actually exiſt, we may naturally ſuppoſe that colonies of Egyptian prieſts found their way into India, as they did afterwards into Aſia Minor, Italy and Greece. That colonies of Egyptians did actually penetrate into that country, and ſettle there, many centuries before the nativity, is a fact that cannot be called in queſtion, for reaſons which the bounds preſcribed us on this article will not allow us to enumerate. We ſhall only obſerve, that from the hieroglyphical repreſentations of the Egyptian deities ſeem to have originated thoſe monſtrous idols which from time immemorial have been worſhipped in India, China, Japan, Siam, and even in the remoteſt parts of Aſiatic Tartary.

20 The incarnations of Viſhnou.

Foe is often called *Budha*, *Budda*, and ſometimes *Viſhnou*; perhaps, indeed, he may be diſtinguiſhed by many other names, according to the variety of dialects of the different nations among which his worſhip was eſtabliſhed. An infinitude of fables was propagated by his diſciples concerning him after his death. They pretended that their maſter was ſtill alive; that he had been already born 8000 times; and that he had ſucceſſively appeared under the figure of an ape, a lion, a dragon, an elephant, a boar, &c. Theſe were called the incarnations of Viſhnou. At length he was confounded with the Supreme God; and all the titles, attributes, operations, perfections, and enſigns of the Moſt High were aſcribed to him. Sometimes he is called Amida, and repreſented with the head of a dog, and worſhipped as the guardian of mankind. He ſometimes appears as a princely perſonage, iſſuing from the mouth of a fiſh. At other times, he wears a lunette on his head, in which are ſeen cities, mountains, towers, trees, in ſhort, all that the world contains. Theſe transformations are evidently the children of allegorical or hieroglyphical emblems, and form an exact counterpart to the ſymbolical worſhip of the Egyptians.

The enormous maſs of the mythological traditions which have in a manner deluged the vaſt continent of India, would fill many volumes: We have ſelected the preceding articles as a ſpecimen only, by which our readers may be qualified to judge of the reſt. If they find themſelves diſpoſed to indulge their curioſity at greater length, we muſt remit them to Thevenot's and Hamilton's Travels, to Monſ. Aquetil in his Zond. Aveſta Halhed's Introduction to his tranſlation of the Code of Gentoo Laws, Col. Dow's Hiſtory of Hindoſtan, Groſe's Voyage to the Eaſt Indies, Aſiatic Reſearches, vol. 1. and 2.

21 Perſian mythology. The mythology of the Perſians is, if poſſible, ſtill more extravagant than that of the Hindoos. It ſuppoſes the world to have been repeatedly deſtroyed, and repeopled by creatures of different formation, who were ſucceſſively annihilated or baniſhed for their diſobedience to the Supreme Being. The monſtrous griffin *Simorgh* tells the hero *Caherman* that ſhe had already lived to ſee the earth ſeven times filled with creatures and ſeven times a perfect void; that, before the creation of Adam, this globe was inhabited by a race of beings called *Peri* and *Dives* whoſe character formed a perfect contraſt. 22 Peri and Dives. The Peri are deſcribed as beautiful and benevolent: the dives are deformed, malevolent, and miſchievous, differing from infernal demons only in this, that they are not as yet confined to the pit of hell. They are for ever ranging over the world, to ſcatter diſcord and miſery among the ſons of men. The Peri nearly reſemble the fairies of Europe; and perhaps the Dives gave birth to the giants and magicians of the middle ages. The Peri and Dives wage inceſſant wars; and when the Dives make any of the Peri priſoners, they ſhut them up in iron cages, and hang them on the higheſt trees, to expoſe them to public view, and to the fury of every chilling blaſt.

When the Peri are in danger of being overpowered by their foes, they ſolicit the aſſiſtance of ſome mortal hero; which produces a ſeries of mythological adventures, highly ornamental to the ſtrains of the Perſian bards, and which, at the ſame time, furniſhes an inexhauſtible fund of the moſt diverſified machinery.

One of the moſt celebrated adventurers in the mythology of Perſia is *Tahmuras*, one of their moſt ancient monarchs. This prince performs a variety of exploits, while he endeavours to recover the fairy Merjan. He attacks the Dive Demruſh in his own cave; where, having vanquiſhed the giant or demon, he finds vaſt piles of hoarded wealth: theſe he carries of with the fair captive. The battles, labours, and adventures of Roſtan, another Perſian worthy, who lived many ages after the former, are celebrated by the Perſian bards with the ſame extravagance of hyperbole with which the labours of Hercules have been ſung by the poets of Greece and Rome.

23 Perſia the birth place of chivalry and romance. The adventures of the Perſian heroes breathe all the wildneſs of atchievement recorded of the knights of Gothic romance. The doctrine of enchantments, transformations, &c. exhibited in both, is a characteriſtic ſymptom of one common original. Perſia is the genuine claſſic ground of eaſtern mythology, and the ſource of the ideas of chivalry and romance: from which they were propagated to the regions of Scandinavia, and indeed to the remoteſt corners of Europe towards the weſt.

Perhaps our readers may be of our opinion, when we offer it as a conjecture, that the tales of the war of the Peri and Dives originated from a vague tradition concerning good and bad angels: nor is it, in our opinion, improbable that the fable of the wars between the gods and giants, ſo famous in the mythology of Greece and Italy, was imported into the former of theſe countries from the ſame quarter. For a more particular account of the Perſian mythology, our readers may conſult Dr Hyde de Relig. vet. Perſ. Medor. &c. D. Herbelot's Bibl. Orient, and Mr Richardſon's introduction to his Perſian and Arabic Dictionary.

24 Chaldean mythology. The mythology of the Chaldeans, like that of the other nations of the eaſt, commences at a period myriads of years prior to the æra of the Moſaic creation. Their coſmogony, exhibited by Beroſus, who was a prieſt of Belus, and deeply verſed in the antiquities of his country, is a piece of mythology of the moſt extravagant nature. It has been copied by Euſebius (Chron. l. i. p. 5.): it is likewiſe to be found in Syncellus, copied from Alexander Polyhiſtor. According to this hiſtorian, there were at Babylon written records preſerved with the greateſt care, comprehending a period of fifteen myriads of years. Thoſe writings likewiſe contained a hiſtory of the heavens and the ſea, of the earth, and of the origin of mankind. "In the beginning (ſays Beroſus, copying from Oannes, of whom we ſhall give a brief account below) there was nothing but darkneſs and an abyſs of water, wherein reſided moſt hideous beings produced from a twofold principle. Men appeared with two wings; ſome with two and ſome with four faces. They had one body, but two heads; the one of a man the other of a woman. Other human figures were to be ſeen, furniſhed with the legs and horns of goats. Some had the feet of horſes behind, but before were faſhioned like men, reſembling hippocentaurs." The remaining part of this mythology is much of the ſame complexion; indeed ſo extravagant, that we imagine our readers will readily enough diſpenſe with our tranſlating the ſequel. "Of all theſe (ſays the author) were preſerved delineations in the temple of Belus at Babylon. The perſon who was ſuppoſed to preſide over them was called *Omorea*, This word, in the Chaldean language, is *Thaleth*, which the Greeks call θαλασσα but it more properly imports the moon. Matters being in this ſituation, *their* god (ſays Euſebius), *the* god (ſays Syncellus) came and cut the woman aſunder; and out of one half of her he formed the earth, and out of the other he made the heavens; and, at the ſame time, he deſtroyed the monſters of the abyſs." This whole mythology is an allegorical hiſtory copied from hieroglyphical repreſentations, the real purport of which could not be decyphered by the author. Such, in general, were the conſequences of the hieroglyphical ſtyle of writing.

25 Oannes the legiſlator of the Chaldeans. *Oannes*, the great civilizer and legiſlator of the Chaldeans, according to Apollodorus, who copied from Beroſus, was an amphibious animal of a heterogeneous appearance. He was endowed with reaſon and a very uncommon acuteneſs of parts. His whole body reſembled a fiſh. Under the head of a fiſh he had alſo another head, and feet below ſimilar to thoſe of a man, which were ſubjoined to the tail of the fiſh. His voice and language were articulate and perfectly intelligible, and there was a figure of him ſtill extant in the days of Beroſus. He made his appearance in the Erythrean or Red Sea, where it borders upon Babylonia. This monſtrous being converſed with men by day; but at night he plunged into the ſea, and remained concealed in the water till next morning. He taught the Babylonians the uſe of letters and the knowledge of all the arts and ſciences. He inſtructed them in the method of building houſes, conſtructing temples, and all other edifices. He taught them to compile

laws and religious ceremonies, and explained to them the principles of mathematics, geometry and aſtronomy. In a word, he communicated to them every thing neceſſary, uſeful and ornamental: and ſo univerſal were his inſtructions, that not one ſingle article had ever been added to them ſince the time they were firſt communicated. Helladius is of opinion that this ſtrange perſonage, whoever he was, came to be repreſented under the figure of a fiſh, not becauſe he was actually believed to be ſuch, but becauſe he was clothed with the ſkin of a ſeal. By this account our readers will ſee that the Babylonion Oannes is the exact counterpart of the Fo-hi of the Chineſe, and the Thyoth or Mercury Triſmegiſtus of the Egyptians. It is likewiſe apparent, that the idea of the monſter compounded of the man and the fiſh has originated from ſome hieroglyphic of that form grafted upon the appearance of man. Some modern mythologiſts have been of opinion that Oannos was actually Noah the great preacher of righteouſneſs: who as ſome think, ſettled in Shinar or Chaldea after the deluge, and who, in conſequence of his connection with that event, might be properly repreſented under the emblem of *the Man of the Sea*.

26 The nativity of the goddeſs of beauty and love.

The nativity of Venus, the goddeſs of beauty and love, is another piece of mythology famous among the Babylonians and Aſſyrians. An egg, ſay they, of a prodigious ſize, dropt from heaven into the river Euphrates. Some doves ſettled upon this egg, after that the fiſhes had rolled it to the bank. In a ſhort time this egg produced Venus, who was afterwards called the ***Dea Syria***, the Syrian goddeſs. In conſequence of this tradition (ſays Hyginus), pigeons and fiſhes became ſacred to this goddeſs among the Syrians, who always abſtained from eating the one or the other. Of this imaginary being we have a very exact and entertaining hiſtory in the treatiſe *De Dea Syria* generally aſcribed to Lucian.

In this mythological tradition our readers will probably diſcover an alluſion to the celebrated *Mundane egg:* and at the ſame time the ſtory of the fiſhes will lead them to anticipate the connection between the ſea and the moon. This ſame deity was the Atargatis of Aſcalon, deſcribed by Diodorus the Sicilian; the one-half of her body a woman, and the other a fiſh. This was no doubt a hieroglyphic figure of the moon, importing the influence of that planet upon the ſea and the ſex. The oriental name of this deity evidently points to the moon; for it is compounded of two Hebrew words (B), which import "the queen of the hoſt of heaven."

27 The fable of Semiramis.

The fable of Semiramis is nearly connected with the preceding one. Diodorus Siculus has preſerved the mythological hiſtory of this deity, which he and all the writers of antiquity have confounded with the Babylonian princeſs of the ſame name. That hiſtorian informs us, that the word *Semiramis*, in the Syrian dialect, ſignifies "a wild pigeon;" but we apprehend that this term was a name or eipithet of the moon, as it is compounded of two words (C) of an import naturally applicable to the lunar planet. It was a general practice among the Orientals to denominate their ſacred animals from that deity to which they were conſecrated. Hence the Moon being called *Semiramis:* and the pigeon being ſacred to her divinity, the latter was called by the name of the former.

As the bounds preſcribed this article renders it impoſſible for us to do juſtice to this intereſting piece of mythology we muſt beg leave to refer our readers for farther information to Diod. Sic. l. ii. Hyginus Poet. Aſtron. fab. 197. Pharnutus de Nat. Deor. Ovid. Metam l. iv. Athen. in Apol. Izetzes Chil. ix. cap. 275. Seld. de Diis Syr. Syrit. ii p. 183.

28 Little known of Arabian mythology.

We ſhould now proceed to the mythology of the Arabians, the far greateſt part of which is, however, buried in the abyſs of ages; though, when we reflect on the genius and character of that people, we muſt be convinced that they too, as well as the other nations of the eaſt, abounded in fabulous relations and romantic compoſitions. The natives of that country have always been enthuſiaſtically addicted to poetry, of which fable is the eſſence. Wherever the muſes have erected their throne, fables and miracles have always appeared in their train. In the Koran we meet with frequent alluſions to well-known traditionary fables. Theſe had been tranſmitted from generation to generation by the bards and rhapſodiſts for the entertainment of the vulgar. In Arabia, from the earlieſt ages, it has always been one of the favourite entertainments of the common people, to aſſemble in the ſerene evenings around their tents, or on the platforms with which their houſes are generally covered, or in large halls erected for the purpoſe, in order to amuſe themſelves with traditional narrations of the moſt diſtinguiſhed actions of their moſt remote anceſtors. Oriental imagery always embelliſhed their romantic details. The glow of fancy, the love of the marvellous, the propenſity towards the hyperbolical, and the vaſt, which conſtitute the eſſence of oriental deſcription, muſt ever have drawn the relation aſide into the devious regions of fiction and fairy-land. The religion of Mahomet beat down the original fabric of idolatry and mythology together. The Arabians fables current in modern times, are borrowed or imitated from Perſian compoſitions; Perſia being ſtill the grand nurſery of romance in the eaſt.

29 Egyptian mythology

In Egypt we find idolatry, theology, and mythology, almoſt inſeparably blended together. The inhabitants of this region, too, as well as of others in the vicinity of the centre of population, adhered for ſeveral centuries to the worſhip of the true God. At laſt, however, conſcious of their own ignorance, impurity, imperfection, and total unfitneſs to approach an infinitely perfect Being, diſtant, as they imagined, and inviſible, they began to caſt about for ſome beings more exalted and more perfect than themſelves, by whoſe mediation they might prefer their prayers to the ſupreme Majeſty of heaven. The luminaries of heaven, which they imagined were animated bodies, naturally preſented themſelves. Theſe were ſplendid and glorious beings. They were thought to partake of the divine nature: they were revered as the ſatraps, prefects.

(B) *Adar* or *Hadar*, "*magnificus*;" and *Gad*, "*exercitus turmi.*"

(C) *Shem* or *Sem*, "a ſign," and *ramath*, "high."

prefects, and repreſentatives of the ſupreme Lord of the univerſe. They were viſible, they were beneficient; they dwelt nearer to the gods, they were near at hand, and always acceſſible. Theſe were, of courſe, employed as mediators and interceſſors between the ſupreme Divinity and his humble ſubjects of this lower world. Thus employed, they might claim a ſubordinate ſhare of worſhip, which was accordingly aſſigned them. In proceſs of time, however, that worſhip, which was originally addreſſed to the Supreme creator by the mediation of the heavenly bodies, was in a great meaſure forgotten, and the adoration of mankind ultimately terminated on thoſe illuſtrious creatures. To this circumſtance, we think, we may aſcribe the origin of that ſpecies of idolatry called *Zabiiſm*, or the worſhip of the hoſt of heaven, which overſpread the world early and almoſt univerſally. In Egypt this mode of worſhip was adopted in all its moſt abſurd and moſt enthuſiaſtic forms: and at the ſame time the moſt heterogeneous mythology appeared in its train. The mythology of the ancient Egyptians was ſo various and multiform, ſo complicated and ſo myſterious, that it would require many volumes even to give a ſuperficial account of its origin and progreſs, not only in its mother country, but even in many other parts of the eaſtern and weſtern world. Beſides, the idolatry and mythology of that wonderful country are ſo cloſely connected and ſo inſeparably blended together, that it is impoſſible to deſcribe the latter without at the ſame time developing the former. We hope, therefore, our readers will not be diſapointed if, in a work of this nature, we touched only upon ſome of the leading or moſt intereſting articles of this complicated ſubject.

30
Origin of Zabaiſm.

31
Reign of gods and demigods, &c. in Egypt.

The Egyptians confounded the revolutions of the heavenly bodies with the reigns of their moſt early monarchs. Hence the incredible number of years included in the reign of their eight ſuperior gods, who, according to them, filled the Egyptian throne ſucceſſively in the moſt early periods of time. To theſe, according to their ſyſtem, ſucceeded twelve demigods, who likewiſe reigned an amazing number of years. Theſe imaginary reigns were no other than the periodical revolutions of the heavenly bodies preſerved in their almanacks, which might be carried back, and actually were carried back, at pleaſure. Hence the fabulous antiquity of that kingdom. The imaginary exploits and adventures of theſe gods and demigods furniſhed an inexhauſtible fund of mythological romances. To the demigods ſucceeded the kings of the cynic cycle, perſonages equally chimerical with the former. The import of this epiphet has greatly perplexed critics and etymologiſts. We apprehend it is an oriental word importing *royal* dignity, elevation of rank. This appellation intimated, that the monarchs of that cycle, admitting that they actually exiſted, were more powerful and more highly revered than their ſucceſſors. After the princes of the cynic cycle comes another race, denominated *Nekyes*, a title likewiſe implying royal, ſplendid, glorious. Theſe cycles figure high in the mythological annals of the Egyptians, and have furniſhed materials for a variety of learned and ingenious diſquiſitions. The wars and adventures of Oſiris, Orus, Typhon, and other allegorical perſonages who figure in the Egyptian rubric; the wanderings of Iſis, the ſiſter and wife of Oſiris; the transformation of the gods into divers kinds of animals; their birth, education, peregrinations, and exploits;—compoſe a body of mythological fictions ſo various, ſo complicated, ſo ridiculous, and often ſo apparently abſurd, that all attempts to develope and explain them have hitherto proved unſucceſsful. All, or the greateſt part, of thoſe extravagant fables, are the offspring of hieroglyphical or allegorical emblems deviſed by the prieſts and ſages of that nation, with a view to conceal the myſteries of their religion from that claſs of men whom they ſtigmatized with the name of the uninitiated rabble.

32
Birth, exploits, and transformation of the gods.

33
Worſhip of brute animals, &c.

The worſhip of brute animals and of certain vegetables univerſal among the Egyptians, was another exuberant ſource of mythological adventures. The Egyptian prieſts, many of whom were likewiſe profound philoſophers, obſerved or pretended to obſerve, a kind of analogy between the qualities of certain animals and vegetables, and thoſe of ſome of their ſubordinate divinities. Such animals and vegetables they adopted, and conſecrated to the deities to whom they were ſuppoſed to bear this analogical reſemblance: and in proceſs of time they conſidered them as the viſible emblems of thoſe divinities to which they were conſecrated. By theſe the vulgar addreſſed their archetypes: in the ſame manner, as in other countries, pictures and ſtatues were employed for the very ſame purpoſe. The mob, in proceſs of time, forgetting the emblematical character of thoſe brutes and vegetables, addreſſed their devotion immediately to them; and of courſe theſe became the ultimate objects of vulgar adoration,

After that theſe objects, animate or inanimate, were conſecrated as the viſible ſymbols of the deities, it ſoon became faſhionable to make uſe of their figures to repreſent thoſe deities to which they were conſecrated. This practice was the natural conſequence of the hieroglyphical ſtyle which univerſally prevailed among the ancient Egyptians. Hence Jupiter Ammon was repreſented under the figure of a ram, Apis under that of a cow, Oſiris of a bull, Pan of a goat, Thoth or Mercury of an ibis, Bubaſtis or Diana of a cat, &c. It was likewiſe a common practice among thoſe deluded people to dignify theſe objects, by giving them the names of thoſe deities which they repreſented. By this mode of dignifying theſe ſacred emblems, the veneration of the rabble was conſiderably enhanced, and the ardour of their devotion inflamed in proportion. From theſe two ſources, we think, are derived the fabulous transformations of the gods, ſo generally celebrated in the Egyptian mythology, and from it imported into Greece and Italy. In conſequence of this practice, their mythological ſyſtem was rendered at once enormous and unintelligible.

34
Mercury Triſmegiſtus the author of the [illegible] mythology.

Their Thoth, or Mercury Triſmegiſtus, was, in our opinion, the inventor of this unhappy ſyſtem. This perſonage, according to the Egyptians, was the original author of letters, geometry, aſtronomy, muſic, architecture in a word, of all the elegant and uſeful arts, and of all the branches of ſcience and philoſophy. He it was who firſt diſcovered the analogy between the divine affections, influences, appearances, operations, and the correſponding properties, qualities, and inſtincts of certain animals, and the propriety of dedicating particular kinds of vegetables to the ſervice of particular deities.

The prieſts, whoſe province it was to expound the myſteries of that allegorical hieroglyphical religion (ſee Mysteries), gradually loſt all knowledge of the primary import of the ſymbolical characters. To ſupply this defect, and at the ſame time to veil their own ignorance, the ſacerdotal inſtructors had recourſe to fable and fiction. They heaped fable upon fable, till their religion became an accumulated chaos of mythological abſurdities.

Two of the moſt learned and moſt acute of the ancient philoſophers have attempted a rational explication of the latent import of the Egyptian mythology; but both have failed in the attempt; nor have the moderns, who have laboured in the ſame department, performed their part with much better ſucceſs. Inſtead, therefore, of proſecuting this inexplicable ſubject, which would ſwell this article beyond all proportion, we muſt beg leave to refer thoſe who are deſirous of further information to the following authors, where they will find enough to gratify their curioſity, if not to inform their judgment: Herodotus, lib. ii. Diodorus Siculus, lib. i. Plut. Iſis and Oſiris; Jamblichus de Myſt. Egypt. Horapollo Hierogyp. Egypt. Macrob. Sat. cap. 23. among the ancients: and among the moderns. Kircher's Oedip. Voſſ. de orig. et prog. Idol. Mr Bryant's Annalyſis of Anc. Mythol. Monſ. Gebelin Monde prim.; and above all, to the learned Jablonſki's Panth. Egyptiorum.

35 Phœnician mythology

The elements of Phœnician mythology have been preſerved by Euſebius, Præp. Evang. ſub. init. In the large extract which that learned father hath copied from Philo Byblius's tranſlation of Sanchoniatho's Hiſtory of Phœnicia, we are furniſhed with ſeveral articles of mythology. Some of theſe throw conſiderable light on ſeveral paſſages of the ſacred hiſtory: and all of them are ſtrictly connected with the mythology of the Greeks and Romans. There we have preſerved a brief but entertaining detail of the fabulous adventures of Uranus, Cronus, Dagon, Thyoth or Mercury, probably the ſame with the Egyptian hero of that name. Here we find Muth or Pluto, Æphœſtus or Vulcan, Æſculapius, Nereus, Poſcedon or Neptune, &c. Aſtarte, or Venus Urania, makes a conſpicuous figure in the catalogue of Phœnician worthies: Pallas or Minerva is planted on the territory of Attica; in a word, all the branches of the family of the Titans, who in after ages figured in the rubric of the Greeks, are brought upon the ſtage, and their exploits and adventures briefly detailed.

36 Grecian mythology derived from Egypt and Phœnicia.

By comparing this fragment with the mythology of the Atlantidæ and that of the Cretans preſerved by Diodorus the Sicilian, lib. v. we think there is good reaſon to conclude, that the family of the Titans, the ſeveral branches of which ſeem to have been both the authors and objects of a great part of the Grecian idolatry, originally emigrated from Phœnicia. This conjecture will receive additional ſtrength, when it is conſidered, that almoſt all their names recorded in the fabulous records of Greece, may be eaſily traced up to a Phœnician original. We agree with Herodotus, that a conſiderable part of the idolatry of Greece may have been borrowed from the Egyptians; at the ſame time, we imagine it highly probable, that the idolatry of the Egyptians and Phœnicians were, in their original conſtitution, nearly the ſame. Both ſyſtems were Sabiiſm, or the worſhip of the hoſt of heaven. The Pelaſgi, according to Herodotus, learned their names of the gods from the Egyptians; but in this conjecture he is certainly warped by his partiality for that people. Had thoſe names been imported from Egypt, they would no doubt have betrayed their Egyptian original; whereas, every etymologiſt will be convinced that every one is of Phœnician extraction.

The adventures of Jupiter, Juno Mercury, Apollo, Diana, Mars, Minerva, or Pallas, Venus, Bacchus, Ceres, Proſerpine, Pluto, Neptune, and the other deſcendants and coadjutors of the ambitious family of the Titans, furniſh by far the greateſt part of the mythology of Greece. They left Phœnicia, we think, about the age of Moſes; they ſettled in Crete, a large and fertile iſland; from this region they made their way into Greece, which, according to the moſt authentic accounts, was at that time inhabited by a race of ſavages. The arts and inventions which they communicated to the natives; the myſteries of religion which they inculcated; the laws, cuſtoms, polity, and good order, which they eſtabliſhed; in ſhort, the bleſſings of humanity and civilization, which they every where diſſeminated in proceſs of time, inſpired the unpoliſhed inhabitants with a kind of divine admiration. Thoſe ambitious mortals improved this admiration into divine homage and adoration. The greater part of the worſhip, which had been formerly addreſſed to the luminaries of heaven, was now transferred to thoſe illuſtrious perſonages. They claimed and obtained divine honours from the deluded rabble of enthuſiaſtic Greeks. Hence ſprung an inexhauſtible, fund of the moſt inconſiſtent and irreconcileable fictions.

37 Hence the inconſiſtent fictions of the Gerck poets.

The foibles and frailties of the deified mortals were tranſmitted to poſterity, incorporated as it were with the pompous attributes of ſupreme divinity. Hence the heterogeneous mixture of the mighty and the mean which chequers the characters of the heroes of the Iliad and Odyſſey. The Greeks adopted the oriental fables; the import of which they did not underſtand. Theſe they accommodated to heroes and illuſtrious perſonages, who had figured in their own country in the earlieſt periods. The labours of Hercules originated in Egypt, and evidently relate to the annual progreſs of the ſun in the zodiac, though the vain glorious Greeks accommodated them to a hero of their own, the reputed ſon of Jupiter and Alcmena. The expedition of Oſiris they borrowed from the Egyptians, and transferred to their Bacchus, the ſon of Jupiter and Semele the daughter of Cadmus. The transformation and wanderings of Io are evidently tranſcribed from the Egyptian romance of the travels of Iſis in queſt of the body of Oſiris, or of the Phœnician Aſtarte, drawn from Sanconiathon. *Io* or *Ioh* is in reality the Egyptian name of the moon; and Aſtarte was the name of the ſame planet among the Phœnicians. Both theſe fables are allegorical repreſentations of the anomalies of the lunar planet, or perhaps of the progreſs of the worſhip of that planet in different parts of the world. The fable of the conflagration occaſioned by Phaeton is clearly of oriental extraction, and alludes to an exceſſive drought which in the early periods of time ſcorched Ethiopia and the adjacent countries. The fabulous adventures of Perſeus are ſaid to have happened in the ſame regions, and are all allegorical repreſentations of the influence of the ſolar luminary; for the original Perſeus was the ſun. The rape of Proſerpine and the wanderings of Ceres: the Eleuſinian myſteries; the orgia or ſacred rites of Bacchus; the rites and worſhip of the Cabiri—were imported from Egypt and Phœnicia: but ſtrangely garbled and disfigured by the Hierophants of Greece. The gigantomachia, or war between the gods and the giants, and all the fabulous events, and varieties of that war, form an exact counterpart to the battles of the Peri and Dives, celebrated in the romantic annals of Perſia.

38
The Greeks ignorant of oriental languages.

A conſiderable part of the mythology of the Greeks ſprung from their ignorance of the oriental languages. They diſdained to apply themſelves to the ſtudy of languages ſpoken by people whom, in the pride of their heart, they ſtigmatiſed with the epithet of *barbarians*. This averſion to every foreign dialect was highly detrimental to their progreſs in the ſciences. The ſame neglect or averſion has, we imagine, proved an irreparable injury to the republic of letters in all ſucceeding ages. The aoids or ſtrolling bards laid hold on thoſe oriental legends, which they ſophiſticated with their own additions and improvements, in order to accommodate them to the popular taſte. Theſe wonderful tales figured in their rhapſodical compoſitions, and were greedily ſwallowed down by the credulous vulgar. Thoſe fictions, as they rolled down, were conſtantly augmented with freſh materials, till in proceſs of time their original import was either forgotten or buried in impenetrable darkneſs. A multitude of theſe Heſiod has collected in his Theogonia, or generation of the gods, which unhappily became the religious creed of the illiterate part of the Greeks. Indeed, fable was ſo cloſely interwoven with the religion of that airy volatile people, that it ſeems to have contaminated not only their religious and moral, but even their political tenets.

39
Oracle of Dodona.

The far-famed oracle of Dodona was copied from that of Ammon of Thebes in Egypt: The oracle of Apollo at Delphos was an emanation from the ſame ſource: The celebrated Apollo Pythius of the Greeks was no other than *Ob* or *Aub* of the Egyptians, who denominated the baſiliſk or royal ſnake *Ob Obi*, becauſe it was held ſacred to the ſun. *Ob* or *Aub* is ſtill retained in the Coptic dialect, and is one of the many names or epithets of that luminary. In ſhort, the ground-work of the Grecian mythology is to be traced in the eaſt. Only a ſmall part of it was fabricated in the country; and what was imported pure and genuine was miſerably ſophiſticated by the hands through which it paſſed, in order to give it a Grecian air, and to accommodate its ſtyle to the Grecian taſte. To enlarge upon this topic would be altogether ſuperfluous, as our learned readers muſt be well acquainted with it already, and the unlearned may without much trouble or expence furniſh themſelves with books upon that ſubject.

39
Roman mythology borrowed from Greece.

The Roman mythology was borrowed from the Greeks. That people had addicted themſelves for many centuries to the arts of war and civil polity. Science and philoſophy were either neglected or unknown. At laſt they conquered Greece, the native land of ſcience, and then "Græcia capta ferum, victorem cepit et artes intulit agreſti Latio." This being the caſe, their mythology was, upon the whole, a tranſcript from that of Greece. They had indeed gleaned a few fables from the Pelaſgi and Etruſcans, which, however, are of ſo little conſequence, that they are ſcarce worth the trouble of tranſcribing.

The mythology of the Celtic nations is in a good meaſure loſt. There may poſſibly ſtill remain ſome veſtiges of the Druidical ſuperſtition in the remoteſt parts of the Highlands and iſlands of Scotland; and perhaps in the uncivilized places of Ireland. Theſe we preſume, would afford our readers but little entertainment, and ſtill leſs inſtruction. Inſtead therefore of giving a detail of thoſe unintereſting articles, we ſhall beg leave to refer our readers to Oſſian's Poems, and Col. Valency's Collections of Iriſh Antiquities, for ſatisfaction on that ſubject.

40
Mythology of the northern nations.

The mythology of the northern nations, *i. e.* of the Norwegians, Danes, Swedes, Icelanders, &c. are uncommonly curious and entertaining. The Edda and Voluſpa contain a complete collection of fables which have not the ſmalleſt affinity with thoſe of the Greeks and Romans. They are wholly of an oriental complexion, and ſeem almoſt congenial with the tales of the Perſians above deſcribed. The Edda was compiled in Iceland in the 13th century. It is a kind of ſyſtem of the Scandinavian mythology: and has been reckoned, and we believe juſtly, a commentary on the Voluſpa, which was the Bible of the northern nations.

41
Odin or Woden.

Odin or Othin, or Woden or Waden, was the ſupreme divinity of thoſe people. His exploits and adventures furniſh the far greateſt part of their mythological creed. That hero is ſuppoſed to have emigrated from the eaſt; but from what country or at what period is not certainly known. His atchievments are magnified beyond all credibility. He is repreſented as the god of battles, and as ſlaughtering thouſands at a blow. His palace is called *Valhal*: it is ſituated in the city of Midgard, where, according to the fable, the ſouls of heroes who had bravely fallen in battle enjoy ſupreme felicity. They ſpend the day in mimic hunting-matches, or imaginary combats. At night they aſſemble in the palace of Valhalla, where they feaſt on the moſt delicious viands, dreſſed and ſerved up by the *Valkyriæ*, virgins adorned with celeſtial charms, and fluſhed with the bloom of everlaſting youth. They ſolace themſelves with drinking mead out of the ſkulls of enemies whom they killed in their days of nature. Mead, it ſeems, was the nectar of the Scandinavian heroes.

42
The hell and devil of the Scandinavians.

Sleepner, the horſe of Odin, is celebrated along with his maſter. Hela, the Hell of the Scandinavians, affords a variety of fables equally ſhocking and heterogeneous. Loke, the evil genius or devil of the northern people, nearly reſembles the Typhon of the Egyptians. Signa or Sinna is the conſort of Loke; from this name the Engliſh word *ſin* is derived. The giants Weymur, Ferbauter, Belupher, and Helhendi, perform a variety of exploits, and are exhibited in the moſt frightful attitudes. One would be tempted to imagine, that they perform the exact counterpart of the giants of the Greek and Roman mythologiſts. Inſtead of glancing at theſe ridiculous and unintereſting fables, which is all that the limits preſcribed us would permit, we ſhall take the liberty to lay before our readers a brief account of the contents of the Voluſpa, which is indeed the text of the Scandinavian mythology.

43 The Voluſpa.

The word *Voluſpa* imports, "the prophecy of Vola or Fola." This was perhaps a general name for the prophetic ladies of the north, as Sybil was appropriated to women endowed with the like faculty in the ſouth. Certain it is, that the ancients generally connected madneſs with the prophetic faculty, Of this we have two celebrated examples; the one in Lycophron's Alexandria, and the other in the Sybil of the Roman Poet. The word *vola* ſignifies "mad or fooliſh;" whence the Engliſh words *fool*, *fooliſh*, *folly*. *Spa*, the latter part of the compoſition, ſignifies "to prophecy," and is ſtill current among the common people in Scotland, in the word *Spæ*, which has nearly the ſame ſignification,

The Voluſpa conſiſts of between 200 and 300 lines. The propheteſs having impoſed ſilence on all intelligent beings, declares that ſhe is about to reveal the works of the Father of nature, the actions and operations of the gods, which no mortal ever knew before herſelf. She then begins with a deſcription of the chaos; and then proceeds to the formation of the world, the creation of the different ſpecies of its inhabbitants, giants, men, and dwarfs. She then explains the employments of the fairies or deſtinies, whom the northern people call *nornies*, the functions of the deities, their moſt memorable adventures, their diſputes with Loke, and the vengeance that enſued. She at laſt concludes with a long and indeed animated deſcription of the final ſtate of the univerſe, and its diſſolution by a general conflagration.

In the cataſtrophe, Odin and all the rabble of the pagan divinities, are to be confounded in the general ruin, no more to appear on the ſtage of the univerſe. Out of the ruins of the former world, according to the Voluſpa, a new one ſhall ſpring up, arrayed in all the bloom of celeſtial beauty.

Such is the doctrine exhibited in the fabulous Voluſpa. So congenial are ſome of the details therein delivered, eſpecially their relating to the final diſſolution of the preſent ſyſtem, and the ſucceſſion of a new heaven and a new earth, that we find ourſelves ſtrongly inclined to ſuſpect, that the original fabrication of the work was a ſemipagan writer, much of the ſame complexion with the authors of the Sybilline oracles, and of ſome other apocryphal pieces which appeared in the world during the firſt ages of Chriſtianity.

44 Mythology of Mexico and Peru.

In America, the only mythological countries muſt be Mexico and Peru. The other parts of that large continent were originally inhabited by ſavages, moſt of them as remote from religion as from civilization. The two vaſt empires of Mexico and Peru had exiſted about 400 years only before the Spaniſh invaſion. In neither of them was the uſe of letters underſtood; and of courſe the ancient opinions of the natives relating to the origin of the univerſe, the changes which ſucceeded, and every other monument of antiquity, was obliterated and loſt. Clavigero has indeed enumerated a vaſt canaille of ſanguinary gods worſhipped by the Mexicans; but produces nothing either entertaining or intereſting with reſpect to their mythology. The information to be derived from any other quarter is little to be depended upon. It paſſes through the hands of bigoted miſſionaries or other eccleſiaſtics, who were ſo deeply tinctured with fanaticiſm, that they viewed every action, every ſentiment, every cuſtom, every religious opinion and ceremony of thoſe half civilized people, through a falſe medium. They often imagined they diſcovered reſemblances and analogies between the rites of thoſe ſavages and the dogmas of Chriſtianity, which no where exiſted but in their own heated imagination.

The only remarkable piece of mythology in the annals of the Peruvians, is the pretended extraction of Manco Capac the firſt Inca of Peru, and of Mama Ocolla his conſort. Theſe two illuſtrious perſonages appeared firſt on the banks of the lake Titiaca. They were perſons of a majeſtic ſtature, and clothed in decent garments. They declared themſelves to be the children of the Sun, ſent by their beneficient parent, who beheld with pity the miſeries of the human race, to inſtruct and to reclaim them. Thus we find theſe two legiſlators availed themſelves of a pretence which had often been employed in more civilized regions to the very ſame purpoſes. The idolatry of Peru was gentle and beneficent, that of Mexico gloomy and ſanguinary. Hence we may ſee, that every mode of ſuperſtition, where a divine revelation is not concerned. borrows its complexion from the characters of its profeſſors.

In the courſe of this article, our readers will obſerve that we have not much enlarged upon the mythology of the Greeks and Romans; that ſubject, we imagine to be ſo univerſally known by the learned and ſo little valued by the vulgar, that a minute diſcuſſion of it would be altogether ſuperfluous. Beſides, we hope it will be remembered that the narrowneſs of the limits preſcribed us would ſcarce admit of a more copious detail. We would flatter ourſelves, that in the courſe of our diſquiſitions we have thrown out a few reflections and obſervations, which may perhaps prove more acceptable to both deſcriptions of readers.

Mytilus.

MYTILUS, the MUSSEL, in ichthyology: a genus of animals, belonging to the order of vermes teſtacea. The animal is an aſcidia: the ſhell bivalve often affixed to ſome ſubſtance by a beard; the hinge without a tooth, marked by a longitudinal hollow line. Of theſe animals there are a great many ſpecies, ſome of them inhabiting the ſeas, others the rivers and ponds. Several of them are remarkable for the beauty of their internal ſhell, and for the pearls which are ſometimes found in them.

Mytilus.

1. The edulis, or edible muſſel, has a ſtrong ſhell, ſlightly incurvated on one ſide, and angulated on the

other. The end near the hinge is pointed; the other rounded. When the epidermis is taken off, it is of a deep blue colour. It is found in immenſe beds, both in deep water and above low-water mark. The fineſt muſſels in Britain are thoſe called *Hambleton hookers*, from a village called *Hambleton* in that country. They are taken out of the ſea, and placed in the river Weir, within reach of the tide, where they grow very fat and delicious. This ſpecies inhabits the European and Indian ſeas. Between the tropics it is largeſt, and ſmalleſt within the polar circle. It is ſaid to be hurtful if too often eat, or in too great quantities; and is even ſometimes poiſonous.

2. The modiolus, or great muſſel, with a ſtrong ſhell, blunted at the upper end: one ſide angulated near the middle; from thence dilating towards the end, which is rounded. It dwells in the Mediterranean, Indian European, and American ſeas: and its fleſh, which is a deep orange colour, is eatable It is the greateſt of the muſſels known in Britain; being from ſix to ſeven inches in length; it lies at great depths; often ſeizes the baits of ground-lines, and is taken up with the hooks.

3. The cygneus, or ſwan muſſel, with a thin brittle ſhell, very broad and convex, marked with concentric ſtriæ; attenuated towards one end, dilated towards the other; decorticated about the hinge; the colour a dull green; the length ſix inches, breadth three and a half. It is an inhabitant of the European rivers frequenting chiefly their mouths.

4. The anatinus, or duck muſſel, has a ſhell more oblong and leſs convex than the laſt: is very brittle and ſemitranſparent; the ſpace round the hinges like the laſt; the length about five inches, breadth two. It is found in Europe in freſh waters. Both it and the cygneus are devoured by ſwans and ducks; whence their names: crows alſo feed on theſe muſſels, as well as on different other ſhell fiſh; and it is diverting to obſerve, that when the ſhell is too hard for their bills they fly with it to a great height, drop the ſhell on a rock, and pick out the meat when the ſhell is fractured by the fall.

5. The cryſtagalli, or cock's-comb muſſel, has the ſhell folded or plaited as it were, ſpiny, and both lips rugged. It makes its abode the coral beds of the Indian ocean.

6. The margaritiferus, or pearl bearing muſſel, has the ſhell compreſſed and flat, nearly orbicular, the baſe tranſverſe, and imbricated with dentated coats. It dwells in the ocean of either India. This is the *mater perlarum* of Rumphius, or mother-of-pearl ſhell. On the inſide it is exquiſitely poliſhed, and of the whiteneſs and water of pearl itſelf. It has alſo the ſame luſtre on the outſide after the external laminæ have been taken off by aquafortis and the lapidary's mill. Mother-of-pearl is uſed in inlaid works, and in ſeveral toys, as ſnuff boxes, &c.

7. The lithophagus, or ſtone-eating muſſel, has the ſhell cylindric, the extremities both ways being rounded. It inhabits the Indian, European, and mediterranean ſeas, penetrating and eating away marbles corals, &c. The Indian ſhell is ſofter and nearly tough like leather, but the European is more brittle.

8. The violacea, or violet muſſel, has the ſhell longitudinally furrowed, the rim very obtuſe, ſomewhat formed like the mytilus edulis, but conſiderably larger and more flattened, of a beautiful violet colour. Inhabits the ſouthern ocean. There are about 50 other ſpecies.

Muſſels not only open and ſhut their ſhells at pleaſure, but they have alſo a progreſſive motion; they can faſten themſelves where they pleaſe; they reſpire water like fiſhes; and ſome even flutter about on its ſurface ſo as to inhale air. If they lie in ſhallow places, a ſmall circular motion is ſeen above the heel of the ſhell: and a few moments after, they caſt out the water by one ſingle ſtroke at the other end of the ſhell. The mouth is ſituated near the ſharp angle of the animal, and is furniſhed with four floating fringes in the ſhape of muſtachios which may perhaps anſwer the purpoſe of lips. The barbs which ſurround the edge of almoſt half the muſſel, are a wonderful web of hollow fibres which ſerve as fins or organs of reſpiration, as veſſels for the circulation of the fluids, and probably, as ſome philoſophers ſuppoſe, as wedges for opening their ſhells; for we obſerve two large muſcles or tendons for the purpoſe of ſhutting them; but we in vain look for their antagoniſts, or thoſe which are deſtined to open them. When the muſſel wiſhes to open itſelf, it relaxes the two muſcles or tendons, and ſwells the fringes, which act as wedges and ſeparate the ſhells. The animal ſhuts up itſelf by the contraction of two thick fibrous muſcles which are fixed internally to each end of the ſhells; and theſe ſhells are lined all arround with a membrane or epidermis, which unites them ſo cloſely together when they are ſoaked in water, that not the ſmalleſt drop can eſcape from the muſcle. When muſſels chooſe to walk (A), they often contrive to raiſe themſelves on the ſharp edge of their ſhells, and put forth a fleſhy ſubſtance ſuſceptible of extenſion, which ſerves them as a leg to drag themſelves along, in a kind of groove or furrow which they form in the ſand or mud, and which ſupports the ſhell on both ſides. In ponds, theſe furrows are very obſervable. From the ſame member or leg hang the threads

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(A) The common ſea or edible muſſel has, from its being for the moſt part found faſtened to the rocks, been ſuppoſed by many wholly incapable of progreſſive motion; but this M. Reaumur has ſhown to be an errroneous opinion. It is a common practice in France, at ſuch ſeaſons of the year as do not afford ſun enough to make ſalt, to throw the common ſea-muſſels, which the fiſhermen catch about the coaſts, into the brine-pits. They have an opinion that this renders their fleſh the more tender and delicate, as the rain which falls at theſe ſeaſons makes the waters of the pits much leſs ſalt than the common ſea-water. The muſſels are on this occaſion thrown careleſsly in, in ſeveral different parts of the pits; yet, at whatever diſtance they have been thrown in, the fiſhermen, when they go to take them out, always find them in a cluſter together; and as there is no current of water in theſe places, nor any other power of motion which can have brought the muſſels together, it ſeems threads by which the animals faſten (B) themſelves to rocks or to one another.

According to the obſervations of M. Mery of the Paris Academy, and the ſubſequent experiments of other naturaliſts, muſſels are all androgynous: and, from a peculiar generative organization, each individual is of itſelf capable of propagating its ſpecies, and annually does it without the intercourſe of any other. This is altogether ſingular, and different from what takes place in ſnails, earth-worms, and other hydrogenous or hermaphroditical animals; for though each individual of theſe contains the parts of both ſexes, yet there is always a congreſs of two animals for the propagation of the ſpecies. The parts of generation are

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ſeems very evident that they muſt voluntarily have marched from the places where they were at firſt, to have met thus together. This progreſſive motion is wholly performed by means of what we call the *tongue* of the muſſel, from its ſhape; but, from its uſe in this caſe, appears to rather merit the name of a *leg*, or an *arm*, as by laying hold of any diſtant ſubſtance, and then forcibly contracting itſelf again, it draws along the whole body of the animal. The ſame part, when it has moved the animal to a proper place, ſerves alſo to fix it there, being the organ by which it ſpins the threads which we call its *beard*, by which it is held to a rock, or to another muſſel. The motion of the muſſel, by means of this part, is juſt the ſame with that of a man laid flat on his belly, who would draw himſelf along by laying hold of any thing with one hand and then drawing himſelf to it.

(B) Muſſels are well known to have a power of faſtening themſelves either to ſtones, or to one another's ſhells, in a very ſtrong and firm manner; but the method of doing this was not well underſtood till the obſervations of Mr Reaumur explained it. Every one who opens and examines a common muſſel, will find, that in the middle of the fiſh there is placed a little blackiſh or browniſh body reſembling a tongue. This in large muſſels is near half an inch long, and a little more than the ſixth of an inch in breadth, and is narrower at the origin than at the extremity: from the root of this tongue, or that part of it which is faſtened to the body of the fiſh, there are produced a great number of threads, which, when fixed to any ſolid ſubſtance, hold the muſſel firmly in its place; theſe threads are uſually from an inch to two inches in length, and in thickneſs from that of a hair to that of a hog's briſtle. They iſſue out of the ſhell in that part were it naturally opens, and fix themſelves to any thing that lies in their way, to ſtones, to fragments of ſhells, or which is the moſt common caſe, to the ſhells of other muſſels; whence it happens that there are uſually ſuch large quantities of muſſels found together. Theſe threads are expanded on every ſide, and are uſually very numerous, 150 having been found iſſuing from one ſhell: they ſerve the office of ſo many cables; and, each pulling in a proper direction, they keep the muſſel fixed againſt any force that can be offered from whatever part it come. The filaments are well known to all who eat muſſels, who ever carefully ſeparate them under the name of the *beard*; and Mr Reaumur has found that while the animal is living in the ſea, if they are all torn away by any accident, the creature has a power of ſubſtituting others in their room; he found that if a quantity of muſſels were detached from one another and put into a veſſel of any kind, and in that plunged into the ſea, they in a little time faſtened themſelves both to the ſides of the veſſel and to one another's ſhells; the extremity of each thread ſeemed in this caſe to ſerve in the manner of a hand to ſeize upon any thing that it would fix to, and the other part, which was ſlender and ſmaller, to do the office of an arm in condncting it.

To know the manner of the muſſels performing this operation, this diligent obſerver put ſome muſſels into a veſſel in his chamber, and covered them with ſea water; he there ſaw that they ſoon began to open their ſhells, and each put forth that little body before deſcribed by its reſemblance to a tongue, and at the root of which theſe threads grow; they extended and ſhortened this part ſeveral times, and thruſt it out every way, often giving it not leſs than two inches in length, and trying before, behind, and on every ſide with it, what were the proper places to fix threads at: at the end of theſe trials they let it remain fixed for ſome time on the ſpot which they choſe for that purpoſe, and then drawing it back into the ſhell with great quickneſs, it was eaſy to ſee that they were then faſtened by one of theſe threads to the ſpot where it had before touched and remained fixed for a few minutes; and in repeating this workmanſhip the threads are increaſed in number one at every time, and being fixed in different places they ſuſtain the fiſh at reſt againſt any common force.

The ſeveral threads were found to be very different from one another; the new formed ones being ever whiter, more gloſſy, and more tranſparent than the others: and it appeared on a cloſe examination, that it was not, as might have been moſt naturally ſuppoſed, the office of the tongue to convey the old threads one by one to the new places where they were now to be fixed, but that theſe in reality were now become uſeleſs; and that every thread we ſee now formed, is a new one made at this time; and in fine, that nature has given to ſome ſea-fiſhes, as well as to many land-inſects, a power of ſpinning thoſe threads for their neceſſary uſes: and that muſſels and the like fiſh are under water, what caterpillars and ſpiders are at land.—To be well aſſured of this, however, Mr Reaumer cut off the beard or old threads of a muſcle as cloſe as he could, without injuring the part; and the proof of the opinion of their ſpinning new ones at pleaſure was now brought to this eaſy trial, whether theſe muſſels, ſo deprived of their old ones, could fix themſelves as ſoon as others which were poſſeſſed of theirs, and cold throw out their threads to as conſiderable diſtances.—The experiment proved the truth of the conjecture; for thoſe whoſe beards or old threads were cut off, fixed two ovaries and two ſeminal veſicles. Each ovary and veſicle has its proper duct. It is through thoſe four channels that the eggs and the ſeed of the muſſel are conveyed to the anus, where thoſe two principles unite at their iſſue, which anſwers the purpoſe of generation. It is in the ſpring that muſſels lay their eggs; there being none found in them but in winter. M. Lewenhoek, in ſeveral muſſels which he diſſected, diſcovered numbers of eggs or embryo muſſels in the ovarium, appearing as plainly as if he had ſeen them by the naked eye, and all lying with their ſharp ends faſtened to the ſtring of veſſels by which they receive nouriſhment. The minute eggs, or embryos, are by the parent placed in due order, and in a very cloſe arrangement on the outſide of the ſhell, where, by means of a gluey matter, they adhere very faſt, and continually increaſe in ſize and ſtrength, till becoming perfect muſſels, they fall off and ſhift for themſelves, leaving the holes where they were placed behind them. This abundance the muſſel ſhells very plainly ſhow, when examined by the microſcope, and ſometimes the number is 2000 or 3000 in one ſhell: but it is not certain that theſe have been all fixed there by the muſſel within; for theſe fiſh uſually lying in great numbers near one another, the embryos of one are often affixed to the ſhell of another. The fringed edge of the muſſel, which Lewenhoek calls the *beard*, has in every the minuteſt part of it ſuch variety of motions as is inconceivable; for being compoſed of longiſh fibres, each fibre has on both ſides a vaſt many moving particles.

The muſſel is infeſted by ſeveral enemies in its own element; according to Reaumur it is in particular the prey of a ſmall ſhell-fiſh of the trochus kind. This animal attaches itſelf to the ſhell of the muſſel, pierces it with a round hole, and introduces a ſort of tube five or ſix lines long, which it turns in a ſpiral direction, and with which it ſucks the ſubſtance of the muſſel. Muſſels are alſo ſubject to certain diſeaſes, which have been ſuppoſed to be the cauſe of thoſe bad effects which ſometimes happen from the eating of them. Theſe are ſtated by Dr Mœhring, in the 7th vol. of the German Ephemerides, to be the moſs and the ſcab. The roots of the moſs being introduced into the ſhell the water penetrates through the openings, and gradually diſſolves the muſſel. The ſcab is formed by a ſort of tubercles which are produced by the diſſolution of the ſhell. Certain ſmall crabs, which are ſometimes found in muſſels, likewiſe tend to make them unwholeſome.

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fixed themſelves as ſoon as thoſe in which they were left, and ſpread their threads to as great a diſtance every way.

When the mechaniſm of this manufacture was thus far underſtood, it became a natural deſire to inquire into the nature of the part by which it was performed. This has hitherto been mentioned under the name of the tongue, from its ſhape; but it is truly the arm of the fiſh; and whenever it happens to be looſened from its company, or fixed in a wrong place, it ſerves the animal to drag its whole body ſhell and all along, and to perform its ſeveral motions. It fixes itſelf to ſome ſolid body; and then ſtrongly contracting its length, the whole fiſh muſt neceſſarily follow it, and be pulled towards the place where it is fixed. This is an uſe, however, that this part is ſo rarely put to, that it is not properly to be eſteemed a leg or an arm for this: but, according to its more frequent employment, may much better be denominated the organ by which the threads are ſpun. Though this body is flat in the manner of a tongue for the greater part of its length, it is however rounded or cylindric about the baſe or inſertion, and it is much ſmaller there than in any other part: there are ſeveral muſcular ligaments faſtened to it about the root or baſe, which hold it firmly againſt the middle of the back of the ſhell; of theſe ligaments there are four which are particularly obſervable, and which ſerve to move the body in any direction. There runs all along this body a ſlit or crack, which pierces very deeply into its ſubſtance, and divides it as it were into two longitudinal ſections; this is properly a canal, and along this is thrown the liquor which ſerves to form the threads; and it is in this canal or ſlit that theſe threads are moulded into their form. Externally, this appears only a ſmall crack or ſlit, becauſe the two fleſhy ſections of the parts almoſt meet and cover it; but it is rounded and deep within, and is ſurrounded with circular fibres. This canal is carried regularly on from the tip of the tongue, as it is called, to its baſe, where it becomes cylindric; the cylinder in this part being no other than a cloſe tube or pipe, in which this open canal terminates. The cylindric tube contains a round oblong body, of the nature of the threads, except that it is much larger; and from the extremity of this all the threads are produced, this ſerving as a great cable to which all the other little cordages diſperſed towards different parts are fixed. The tube or pipe in which this large thread is lodged, ſeems the reſervoir of the liquor of which the other threads are formed; all its internal ſurface being furniſhed with glands for its ſecretion.

The muſſel, like many other ſea-fiſhes, abounds in this liquor; and if at any time one touch with a finger the baſe of this ſpinning organ, one draws away with it a viſcous liquor in form of ſeveral threads, like thoſe of the caterpillar, ſpider, and the other ſpinning land-animals. The threads fix themſelves with equal eaſe to the moſt ſmooth and gloſſy, as to rougher bodies; if the muſſels are kept in glaſs-jars of ſea-water, they as firmly faſten themſelves to the glaſs as to any other body. Muſſels, be they ever ſo young, have this property of ſpinning; and by this means they faſten themſelves in vaſt numbers to any thing which they find in the ſea. Mr Reaumur has ſeen them, when as ſmall as millet-ſeeds, ſpin plentifully, though their threads, proportioned to their own weight, are much finer and ſmaller than thoſe of larger muſſels.

The eating of muſſels has ſomtimes produced eryſipetalous inflammations, cutaneous eruptions, inſupportable itching all over the body, great reſtleſſneſs and agitation; and though theſe complaints are eaſily removed by oil, milk, and emetics, and have ſeldom or never proved mortal, yet they have an alarming aſpect, and make the patient ſuffer grievouſly. Theſe noxious effects have been ſuppoſed to be owing to the muſſels or part of them having been diſeaſed. Some authors however have pretended that thoſe effects never take place but between the vernal and autumnal equinox: and M. Beunie, phyſician at Antwerp, in a memoir on this ſubject, ſeems inclined to adopt this opinion; for he recommends abſtinence from muſſels during the months of May, June, July, and Auguſt. The cauſe of theſe noxious effects in the muſſel is, according to this author, altogether accidental. They are occaſioned, he ſays, by a kind of ſtella marina, a little ſea inſect pretty common about the mouth of the Scheldt, which ſometimes lodges itſelf in the muſſel in queſt of food; and whoſe ſpawn is ſo cauſtic and inflammatory, that, even when applied outwardly to the ſkin, it produces itching and ſwellings that are painful in a high degree. The itching occaſioned by touching the ſpawn of the ſtella marina is removed by vinegar; and this known fact induced Dr Beunie to preſcribe the internal uſe of vinegar, after bleeding, evacuations, and emetics. His method conſiſts in recommending a large quantity of refreſhing beverage, and, every hour, three ounces of vinegar diluted in water. The remedy, however, ſeems rather to confirm the opinion of thoſe who impute the diſorder in queſtion to an unperceived commencement of putrefaction in the muſſel; as vinegar is known to be a powerful antiſeptic, and there is no ſort of putrefaction more noxious and offenſive than that of fiſh.—Upon the whole, the edulis, or eatable muſſel, though a rich food, is difficult of digeſtion. In its beſt ſtate it is even noxious to ſome conſtitutions; and when affected by diſeaſe is in ſome degree poiſonous. Muſſels are apt to do moſt harm when eaten raw. They ought always to be boiled with onions, well waſhed with vinegar, and ſeaſoned with pepper; and even thus qualified, they ſhould not be eaten to exceſs or too frequently.

Freſh-water muſſels are not ſo good eating as the ſea-muſſel. The river muſſel, according to M. Poupart, ſwims in the water, and ſometimes appears to flutter on its ſurface. But we believe it more commonly creeps upon the mud, where it remains almoſt always at reſt. The pond muſſel is always larger than that which is found in rivers; and it is a more ſolitary animal. In its motion it makes tracks in the ſand and mud, as already obſerved; and it penetrates into it two or three inches, and ſometimes more. Pearls of conſiderable beauty are found in ſeveral river muſſels; of this kind are the Scots muſſels, thoſe of Valognes in Lorrain, of St Savinier, of Bavaria, and of the marſhes near Augſburg.

MYTTOTON, a coarſe kind of food, uſed by the labouring people among the Greeks, and ſometimes among the Romans. It was made of garlic, onions, eggs, cheeſe, oil, and vinegar, and reckoned very wholeſome.

MYUS (anc. geog.), one of the twelve towns of Ionia; ſeated on the Meander, at the diſtance of 30 ſtadia from the ſea. In Strabo's time it was incorporated with the Mileſians, on account of the paucity of its inhabitants, from its being formerly overwhelmed with water, for which reaſon the Ionians conſigned its ſuffrage and religious ceremonies to the people of Miletus. Artaxerxes allotted this town to Themiſtocles, in order to furniſh his table with meat: Magneſia was to ſupport him in bread, and Lampſacus in wine. The town now lies in ruins.

MYXINE, the HAG: a genus of inſects belonging to the order of vermes inteſtini. It hath a ſlender body, carinated beneath; mouth at the extremity, cirrated; the two jaws pinnated; an adipoſe or rayleſs fin round the tail and under the belly. The only remarkable ſpecies is the glutinoſa, about eight inches long. It inhabits the ocean; enters the mouths of fiſh when on the hooks of lines that remain a tide under water, and totally devours the whole, except ſkin and bones. The Scarborough fiſhermen often take it in the robbed fiſh, on drawing up their lines. Linnæus attributes to it the property of turning water into glue.

N

N, A liquid conſonant, and the 13th letter of the Greek, Latin, Engliſh, &c. alphabets.

The *n* is a naſal conſonant; its ſound is that of a *d*, paſſed through the noſe; ſo that when the noſe is ſtopped by a cold, or the like, it is uſual to pronounce *d* for *n*: M. l'Able de Dangeau obſerves, that in the French, the *n* is frequently a mere naſal vowel, without any thing of the conſonant in it. He calls it the Sclavonic vowel. The Hebrews call their *n nun*, which ſignifies child, as being ſuppoſed the offspring of *m*; partly on account of the reſemblance of ſound, and partly on that of the figure. Thus from the *m*, by omitting the laſt column, is formed *n*; and thus from the capital N, by omitting the firſt column, is formed the Greek minuſcle ν, Hence for *biennies*. &c. the Latins frequently uſe *bimus*; &c. and the ſame people convert the Greek ν, at the end of a word, into an *m*, as φαρμακον, *pharmacum*. &c. See M.

N before *p*, *b*, and *m*, the Latins change into *m*, and frequently into *l* and *r*: as in *in-ludo*, *illudo*; *in-rigo*,

rigo, *irrigo*, &c.: in which they agree with the Hebrews, who in lieu of *nun*, frequently double the following conſonants: and the Greeks do the ſame; as when for *Manlius*, they write Μαλλιος, &c. The Greeks alſo, before κ, γ, χ, ξ, changed the ν into γ: in which they were followed by the ancient Romans; who, for *Angulus*, wrote *Aggulus*; for *anceps*, *agceps*, &c.

The Latins retrench the *n* from Greek nouns ending in ων; as Λεων, *Leo*; Δρακων, *Draco*: on the contrary, the Greeks add it to the Latin ones ending in ο; as Κατων, Νερων, *Cato*, *Nero*.

N, among the ancients, was a numeral letter, ſignifying 900; according to the verſe in Baronius,

N, quoque nongentos numero deſignat habendos.

And when a line was ſtruck over it, N̄, nine thouuſand. Among the ancient lawyers *N. L.* ſtood for *non liquet*, i. e. the cauſe is not clear enough to paſs ſentence upon. N, or N°, in commerce, &c. is uſed as an abbreviation of *numero*, number.

NAARDA, Naarda, *Neerda*, or *Nehardea*, (anc. geog.), a town ſituated on the confines of Meſopotamia and Babylonia; populous, and with a rich and extenſive territory, not eaſily to be attacked by an enemy, being ſurrounded on all ſides by the Euphrates and ſtrong walls (Joſephus). In the lower age the Jews had a celebrated ſchool there.

NAAS, a borough and poſt town of Ireland, in the county of Kildare, and province of Leinſter. It is the ſhire town of that county, and alternately with Athy the aſſizes town. It is diſtant above 15 miles ſouth weſt of Dublin, in N. Lat. 53. 10. W. Long. 6. 50. It ſends two members to parliament; and gives title of viſcount to the family of Burke. It has five fairs in the year.—This place was anciently the reſidence of the kings of Leinſter: the name ſignifies "the place of elders." for here the ſtates of that province aſſembled during the 6th, 7th, and 8th centuries, after the Naaſteighan of Carmen had been anathematiſed by the Chriſtian clergy. On the arrival of the Engliſh it was fortified; many caſtles were erected, the ruins of which are partly viſible; and parliaments were held there. At the foot of the mount or rath are the ruins of a houſe founded in 1484, for eremites of the order of St Auguſtin. In the 12th century the baron of Naas founded a priory dedicated to St John the baptiſt, for Auguſtinian regular canons. In the centre of this town the family of Euſtace erected a monaſtery for Dominican friars, dedicated to St Euſtachius; and it apears that their poſſeſſions in Naas were granted them in the year 1355. This place was a ſtrong hold during the civil wars.

NABATENE, or Regio Nabataeorum, according to Jerome, compriſed all the country lying between the Euphrates and the Red Sea, and thus contained Arabia Deſerta, with a part of the Petræa; ſo called from Nabaioth, the firſt born of Iſmael. According to Diodorus, it was ſituated between Syria and Egypt. The people Nabatæi (1 Maccabees, Diodorus Siculus); inhabiting a deſart and barren country; they lived by plundering their neighbours according to Diodorus. Nabathæus the epithet.

NABIS, tyrant of Sparta, reigned about 204 B. C.; and is reported to have exceeded all other tyrants ſo far, that upon compariſon, he left the epithets of *gracious* and *merciful* to Dionyſius and Phalaris. He is ſaid to have contrived an inſtrument of torture in the form of a ſtatue of a beautiful woman whoſe rich dreſs concealed a number of iron ſpikes in her boſom and arms. When any one therefore oppoſed his demands, he would ſay "If I have not talents enough to prevail with you, perhaps my woman Apega may perſuade you." The ſtatue then appeared; which Nabis taking by the hand, led up to the perſon, who being embraced by it, was thus tortured into compliance. To render his tyranny leſs unpopular, Nabis made an alliance with Flaminius the Roman general, and purſued with the moſt inverate enmity the war which he had undertaken againſt the Achæans. He beſieged Gythium, and defeated Philopœmen in a naval battle. His triumph was ſhort, the general of the Achæans ſoon repaired his loſſes, and Nabis was defeated in an engagement, and killed as he attempted to ſave his life by flight, about 194 years before the Chriſtian era.

NABLOUS, a province of Syria anciently celebrated under the name of the *kingdom of Samaria*. Its capital, likewiſe called *Nablous*, is ſituated near to Sichem on the ruins of the Niepolis of the Greeks, and is the reſidence of a ſhaik, who is ſubordinate to the pache of Damaſcus, from whom he farms the tribute to the province.

NABLUM, in Hebrew, *Nebel*, was an inſtrument of muſic among the Jews It had ſtrings like the harp, and was played upon by both hands. Its form was that of a Greek v. In the Septuagint and vulgate, it is called *nablum*, *pſalterion*, *lyra*; and ſometimes *cithara*.

NABO, or Nebo, in mythology, a deity of the Babylonians, who poſſeſſed the next rank to Bel. It is mentioned by Iſai. chap. xlviii. Voſſius apprehends that Nabo was the moon, and Bel the ſun; but Grotius ſuppoſes that Nabo was ſome celebrated prophet of the country; which opinion is confirmed by the etymology of the name, ſignifying, according to Jerom, "one that preſides over propheſy."

NABOB, properly Navab, the plural of *Naib*, a deputy. As uſed in Bengal, it is the ſame as Nazim. It is a title alſo given to the wives and daughters of princes, as well as to the princes themſelves.

NABONASSAR, firſt king of the Chaldeans or Babylonians: memorable for the Jewiſh æra which bears his name, which is generally fixed in 3257, beginning on Wedneſday February 26th in the 3967th of the Julian period, 747 years before Chriſt. The Babylonians revolting from the Medes, who had overthrown the Aſſyrian monarchy, did, under Nabonaſſar found a dominion, which was much increaſed under Nebuchadnezzar. It is probable, that this Nabonaſſar is that Baladin in the ſecond of Kings xx. 12. father of Merodach, who ſent ambaſſadors to Hezekiah. See 2 Chron. xxxii.

NABOPOLASSAR, king of Babylon: he joined with Aſtyages the Mede, to deſtroy the empire of Aſſyria; which having accompliſhed, they founded the two empires of the Medes under Aſtyages, and the Chaldeans under Nabopolaſſar, 627 B. C.

NABUCHADNEZZAR, or Nabuchodonosor II. king of Aſſyria, ſon of Nabopolaſſar. and ſtyled the *Great*, was aſſociated by his father in the empire, 607 B. C. and the following year he took Jehoiakim king of Judah priſoner, and propoſed to carry him and his ſubjects in captivity into a Babylon; but upon his ſubmiſſion, and promiſſing to hold his kingdom under Nabuchodonoſor, he was permitted to remain at Jeruſalem. In 603 B. C. Jehoiakim attempted to ſhake off the Aſſyrian yoke, but without ſucceſs; and this revolt brought on the general captivity. Nabuchadnezzar having ſubdued the Ethiopians, Arabians, Idumæans, Philiſtines, Syrians, Perſians, Medes, Aſſyrians, and almoſt all Aſia; being puffed up with pride, cauſed a golden ſtatue to be ſet up, and commanded all to worſhip it; which Daniel's companions refuſing to do, they were caſt into the fiery furnace. But as he was admiring his own magnificence, by divine ſentence he was driven from men, and in the ſcripture ſtyle is ſaid to have eaten graſs as oxen: i. e. he was ſeized with the diſeaſe called by the Greeks *lycanthropy*, which is a kind of madneſs that cauſes perſons to run into the fields and ſtreets in the night, and ſometimes to ſuppoſe themſelves to have the heads of oxen or to be made of glaſs. At the end of ſeven years his reaſon returned to him, and he was reſtored to his throne and glory. He died 562 B. C. in the 43d year of his reign: in the 5th of which happened that eclipſe of the ſun mentioned by Ptolemy, which is the ſureſt foundation of the chronology of his reign.

NADIR in aſtronomy, that part of the heavens which is diametrically oppoſite to the zenith or point directly over our heads.

NÆNIA, the goddeſs of funerals at Rome. Her temple was without the gates of the city. The ſongs which were ſung at funerals were alſo called *nænio*. They were generally filled with the praiſes of the deceaſed; but ſometimes they were ſo unmeaning aud improper, that the word became proverbial to ſignify nonſenſe.

NAERDEN, a ſtrong town of the United Provinces in Holland, ſeated at the head of the canals of the province. The foundations of it were laid by William of Bavaria, in 1350. It was taken by the Spaniards in 1572, and by the French in 1672; but it was retaken by the prince of Orange the next year. It ſtands at the ſouth end of the Zuyder Zee, in E. Long. 5. 3. N. Lat. 51. 27.

NÆVIUS (Cneius), a famous poet of Campania, was bred a ſoldier; but quitted the profeſſion of arms, in order to apply himſelf to poetry, which he proſecuted with great diligence. He compoſed a hiſtory in verſe, and a great number of comedies: But it is ſaid, that his firſt performance of this laſt kind ſo diſpleaſed Metellus on account of the ſatyrical ſtrokes it contained, that he procured his being baniſhed from the city; on which he retired to Utica in Africa, where he at length died, 202 B. C. We have only ſome fragments left of his works.

There was another Nævius a famous augur in the reign of Tarquin, who, to convince the king and the Romans of his preternatural power, cut a flint with a raſor, and turned the ridicule of the populace to admiration. Tarquin rewarded his merit by erecting him a ſtatue in the comitium, which was ſtill in being in the age of Auguſtus. The raſor and flint were buried near it under an altar, and it was uſual among the Romans to make witneſſes in civil cauſes ſwear near it. This miraculous event of cutting a flint with a raſor though believed by ſome writers, is treated as fabulous and improbable by Cicero, who himſelf had been an augur.

NÆVUS, a mole on the ſkin, generally called a *mother's mark*; alſo the tumor known by the name of a *wen*.

All preternatural tumors on the ſkin, in the form of a wart or tubercle, are called *excreſcences*; by the Greeks they are called *acrothymia*; and when they are born with a perſon, they are called *nævi materni*, or *marks from the mother*. A large tumor, depending from the ſkin is denominated *ſarcoma*. Theſe appear on any part of the body: ſome of them differ not in their colour from the reſt of the ſkin; whilſt others are red, black, &c. Their ſhapes are various; ſome reſembling ſtrawberries, others grapes, &c. Hieſter adviſes their removal by means of a ligature, a cautery, or a knife, as circumſtances beſt ſuit.

As to the tumor called a *wen*, its different ſpecies are diſtinguiſhed by their contents. They are encyſted tumors; the matter contained in the firſt three following is inſpiſſated lymph, and that in the fourth is only fat. Monſ. Littre was the firſt who particularly deſcribed the fourth kind; and to the following purpoſe he ſpeaks of them all. A wen is ſaid to be of three ſorts, according to the kind of matter it contains: that whoſe contents reſemble boiled rice, or curds, or a bread-poultice, is called *atheroma*; if it reſembles honey, it is named *meliceris*; and if it is like ſuet, it is denominated *ſteatoma*; but there is a fourth ſort, which may be called *lipome*, becauſe of its fat contents reſembling greaſe. He ſays that he has ſeen one on the ſhoulders of a man, which was a thin bag, of a tender texture, full of a ſoft fat, and that it had all the qualities of common greaſe. And though the fat in the lipome reſembles that in the ſteatoma, yet they cannot be the ſame: for the matter of the ſteatoma is not inflammable, nor does it melt; or if it does, it is with great difficulty and imperfectly; whereas it is the contrary with the lipome. When the man who had the above named lipome was fatigued, or had drank freely of ſtrong liquors, his lipome was inflamed for ſome days after, and its contents rarefying increaſed the ſize of the tumor.

The lipome ſeems to be no other than an enlargement of one or more of the cells of the adipoſe membrane, which is filled only with its natural contents. Its ſoftneſs and largeneſs diſtinguiſh it in general from the other ſpecies, though ſometimes the fatty contents will be ſo hard as to deceive. As this kind of wen does not run between the muſcles, nor is poſſeſſed of any conſiderable blood-veſſels, it may always be cut off with eaſe and ſafety.

As to the other kind of wens, their extirpation may or may not be attempted, according as their ſituation is with reſpect to adjacent veſſels, the wounding of which would endanger the patient's life.

NAGERA, or Nagara, a town of Spain, in Old Caſtile, and the territory of Rioja, with the a title of a dutchy and fortreſs: famous for a battle fought in its neighbourhood in 1369. It is ſituated in a fertile country, on a brook called *Naſerilla*. W. Long. 2. 20. N. Lat. 42. 25,

NAGRACUT, a town of India, the capital of a kingdom of the ſame name in the dominions of the

Great Mogul, with a rich temple to which the Indians go in pilgrimage. It is ſeated on the river Ravi. E. Long. 78. 10. N. Lat. 33. 12.

NAHUM, or the *Prophecy of Nahum*, a canonical book of the Old Teſtament.

Nahum, the ſeventh of the 12 leſſer prophets, was a native of Elkoſhai, a little village of Galilee. The ſubject of his prophecy is the deſtruction of Nineveh, which he deſcribes in the moſt lively and pathetic manner: his ſtyle is bold and figurative, and cannot be exceeded by the moſt perfect maſters of oratory. This prophecy was verified at the ſiege of that city by Aſtyages, in the year of the world 3378, 622 years before Chriſt.

NAIADES (fab. hiſt.), certain inferior deities who preſided over rivers, ſprings, wells, and fountains. The Naiades generally inhabited the country, and reſorted to the woods or meadows near the ſtream over which they preſided. They are repreſented as young and beautiful virgins, often leaning upon an urn from which flows a ſtream of water. Ægle was the faireſt of the Naiades, according to Virgil. Their name ſeems to be derived from *ναειν, to flow*. They were held in great veneration among the ancients; and often ſacrifices of goats and lambs were offered to them, with libations of wine, honey, and oil. Sometimes they received only offerings of milk, fruit, and flowers,

NAIANT, in heraldry, a term uſed in blazoning fiſhes, when borne in an horizontal poſture, as if ſwimming.

NAIAS, in botany: A genus of the monandria order, belonging to the diœcia claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The male calyx is cylindrical and bifid; the corolla quadrifid; there is no filament; nor is there any female calyx or corolla; there is one piſtil; and the capſule is ovate and unilocular.

NAID, the interior of the great deſart of Arabia, inhabited by a few ſcattered tribes of feeble and wretched Arabs, See Arabia.

NAIL, unguis, in anatomy. See there, n° 81.

Nails, in building, &c. ſmall ſpikes of iron, braſs, &c. which being drove into wood, ſerve to bind ſeveral pieces together, or to faſten ſomething upon them.

Nails were made uſe of by the ancient Hebrews for cancelling bonds; and the ceremony was performed by ſtriking them through the writing. This ſeems to be alluded to in ſcripture, where God is ſaid by our crucified Saviour to have "blotted out the handwriting of ordinances that was againſt us, and to have taken it out of the way, nailing it to his croſs." Col. ii. 14. For the cauſe and ceremony of driving the annual nail, or *clavus annalis*, among the Romans, ſee *Annalis Clavus*.

Nail, is alſo a meaſure of length, containing the 16th part of a yard.

Nailing of Cannon. When circumſtances make it neceſſary to abandon cannon, or when the enemy's artillery are ſeized, and it is not however poſſible to take them away, it is proper to nail them up, in order to render them uſeleſs: which is done by driving a large nail or iron ſpike into the vent of a piece of artillery, to render it unſerviceable. There are various contrivances to force the nail out, as alſo ſundry machines invented for that purpoſe, but they have never been found of general uſe; ſo that the beſt method is to drill a new vent.

One Gaſper Vimercatus was the firſt who invented the nailing of cannon. He was a native of Bremen and made uſe of his invention firſt in nailing up the artillery of Sigiſmund Malateſta.

NAIN (Lewis Sebaſtian de), one of the moſt learned and judicious critics and hiſtorians France has produced, was the ſon of a maſter of the requeſts, and born at Paris in 1637. At ten years old he went to ſchool at Port Royal, and became one of the beſt writers of that inſtitution. Sacy, his intimate friend and counſellor, prevailed with him in 1676 to receive the prieſthood; which, it ſeems, his great humility would not before ſuffer him to aſpire to. This virtue he ſeems to have poſſeſſed in the extreme; ſo that Boſſuet, ſeeig one of his letters to father Dami, with whom he had ſome little diſpute, beſought him merrily "not be always upon his knees before his adverſary, but raiſe himſelf now and then up." He was ſolicited to puſh himſelf in the church, and Buzanval, biſhop of Beauvois, wiſhed to have him for his ſucceſſor; but Nain, regardleſs of dignities, wiſhed for nothing but retirement. In this he did indeed moſt effectually bury himſelf: and, joining the mortifications of a religious life to an indefatigable purſuit of letters, he wore himſelf entirely out, ſo as to die in 1698, aged 61, though he was formed for a longer life. His principal works are, 1. Memoirs on the eccleſiaſtical hiſtory of the ſix firſt ages of the church, 16 vols 4to. 2. The hiſtory of the emperors, 6 vols 4to. Theſe works are deduced from original ſources, and compoſed with the utmoſt fidelity and exactneſs.

Nain or Naim, ſituated at the bottom of mount Hermon on the north ſide, was anciently a city of the tribe of Iſſachar, in the province of Galilee. It was near the gates of this city that our Saviour reſtored to life the only ſon of a widow, and where he inſpired Mary Magdalen to come and mourn for her ſins at his feet. Theſe circumſtances alone make this place worthy of notice: for at preſent Nain is only a hamlet inhabited by Chriſtians, Mahometans, and Hebrews, where there is not a ſingle monument to attract the curioſity of the traveller.

NAIRES, Nahers, or Nayers, in modern hiſtory, a name which is given by the Malabrians to the military of their country, who form a very numerous claſs or tribe, out of which the ſovereigns of Malabar chooſe their body-guard.

NAIRN, a county of Scotland, comprehending the weſt part of Murray. It is bounded on the north by Murray frith, on the weſt and ſouth by Inverneſs, and on the eaſt by Elgin. The length of it amounts to 20 miles, and the breadth to 14. The air is temperate and ſalubrious, and the winters are remarkably mild. The face of the country is rough and mountainous; yet there are ſome fruitful ſtraths, or valleys, which produce good crops of oats and barley: but in general the country is much better adapted for paſturage. Here are alſo large woods of fir, and other trees, that afford ſhelter to the game, of which there is great plenty. A ſtrath is a long, narrow valley, with a river running through the bottom. Of theſe, the moſt remarkable in this county, are Strathnairn, on the river of that name, in the ſouth-weſt part of the ſhire; and on the ſouth-eaſt ſide, Stratherin, on both ſides of Findhorne river. Nairn is well watered with ſtreams, rivulets, and lakes, abounding with fiſh. In the ſouthern part there is a ſmall lake, called *Moy*, ſurrounding an iſland, on which there is a caſtle belonging to the laird of M'Intoſh; but the greater part of the ſhire is peopled by the Fraſers, a warlike Highland clan, whoſe chief, the Lord Lovat, loſt his life on a ſcaffold for having been concerned in the late rebellion. Here are a great number of villages; but no towns of note except Nairn, ſuppoſed to be the *Tuaſis* of Ptolemy, ſituated at the mouth of the river which bears the ſame name; a royal borough, which gave a title of *lord* to an ancient family, forfeited in the rebellion of 1715. The harbour, which opened in the Murray frith, is now choaked up with ſand; and the commerce of the town is too inconſiderable to deſerve notice. The people in general ſubſiſt by feeding ſheep and black cattle. About four miles from Nairn ſtands the caſtle of Calder, on the river of that name, belonging to a branch of the family of Campbell. In this neighbourhood we find a quarry of free ſtone, and many ſigns of copper. About ſix miles to the north weſt of Nairn, a new fort has been lately built by order of the government, at a place called *Ardſeer* a ſmall iſthmus upon the Murray frith, which it is intended to command.

NAISSANT, in heraldry, is applied to any animal iſſuing out of the midſt of ſome ordinary, and ſhowing only his head, ſhoulders, fore-feet, and legs, with the tip of his tail; the reſt of his body being hid in the ſhield, or ſome charge upon it; in which it differs from *iſſuant*, which denotes a living creature ariſing out of the bottom of any ordinary or charge.

NAISSUS (anc. geog.) a town of Dardania, a diſtrict of Mœſia Superior, ſaid to be the birth-place of Conſtantine the Great, which ſeems probable from his often reſiding at that place. *Naiſſitani*, the people (Coin). Now called *Niſſa*, a city of Servia. E. Long. 25° N. Lat. 43°.

NAKED SEEDS, in botany, thoſe that are not incloſed in any pod or caſe.

NAKIB, in the oriental dignities the name of an officer who is a deputy to the cadiliſkier, or, as he may be called, the lord high chancellor of Egypt, appointed by the grand ſignior. His office is to carry the ſtandard of Mahomet.

NAKOUS, an Egyptian muſical inſtrument, made like two plates of braſs, and of all ſizes, from two inches to a foot in diameter; they hold them by ſtrings faſtened to their middles, and ſtrike them together ſo as to beat time. They are uſed in the Cophtic churches and in the Mahometan proceſſions.

NAMA, in botany: A genius of the digynia order, belonging to the pentandria claſs of plants: and in the natural method, ranking under the 13th order, *Succulentæ*. The calyx is pentaphyllous, the corolla quinquepartite, the capſule unilocular and bivalved.

NAME, denotes a word whereby men have agreed to expreſs ſome idea; or which ſerves to denote or ſignify a thing or ſubject ſpoken of. See WORD.

This the grammarians uſually call a *noun*, *nomen*, though their noun is not of quite ſo much extent as our name. See NOUN.

Seneca, Lib. II. *de Beneficiis*, obſerves that there is a great number of things which have no name; and which, therefore, we are forced to call by other borrowed names. *Ingens eſt* (ſays he) *rerum copia ſine nomine, quas cum propriis appellationibus ſignare non poſſumus, alienis accommodatis utimur*: which may ſhow why, in the courſe of this dictionary, we frequently give divers ſenſes to the ſame word.

Names are diſtinguiſhed into *proper* and *appellative*.

Proper Names, are thoſe which repreſent ſome individual thing or perſon, ſo as to diſtinguiſh it from all other things of the ſame ſpecies; as, *Socrates*, which repreſents a certain philoſopher.

Appellative or *General Names*, are thoſe which ſignify common ideas; or which are common to ſeveral individuals of the ſame ſpecies; as, *horſe*, *animal*, *man*, *oak*, &c.

Proper names are either called *Chriſtian*, as being given at baptiſm; or ſurnames; The firſt imposed for diſtinction of perſons anſwering to the Roman *prænomen*; the ſecond, for the diſtinction of families, anſwering to the *nomen* of the Romans, and the *patronymicum* of the Greeks.

Originally every perſon had but one name; as among the Jews, *Adam*, &c. among the Egyptians, *Buſiris*: among the Chaldees, *Ninus*; the Medes, *Aſtyages*; the Greeks, *Diomedes*; the Romans, *Romulus*: the Gauls, *Divitiacus*; the Germans, *Arioviſtus*; the Britons, *Caſſibelan*; the Engliſh, *Hengiſt*, &c. And thus of other nations, except the ſavages of Mount Atlas, whom Pliny and Marcellinus repreſent as *anonymi*, "nameleſs."

The Jews gave the name at the circumciſion; viz. eight days after the birth: the Romans, to females the ſame day, to males the ninth; at which time they held a feaſt, called *nominalia*.

Since Chriſtianity has obtained, moſt nations have followed the Jews, baptizing and giving the name on the eighth day after the birth; except our Engliſh anceſtors, who till of late, baptiſed and gave the name on the birth day.

The firſt impoſition of names was founded on different views, among different people; the moſt common was to mark the good wiſhes of the parents, or to entitle the children to the good fortune a happy name ſeemed to promiſe. Hence, *Victor*, *Caſtor*, *Fauſtus*, *Statius*, *Probus*, &c.

Accordingly, we find ſuch names, by Cicero called *bona nomina*, and by Tacitus *fauſta nomina*, were firſt enrolled and ranged in the Roman muſters; firſt called to ſerve at the ſacrifices, in the foundation of colonies, &c.—And, on the contrary, Livy calls Atrius Umber, *abominandi omnis nomen*: and Plautus, on occaſion of a perſon named *Lyco*, i. e. "greedy wolf," ſays;

> *Voſmet nunc facite conjecturam ceterum*
> *Quid id ſit hominis, cui Lyco nomen ſiet.*

Hence, Plato recommends it to men to be careful in giving happy names; and the Pythagoreans taught expreſsly, that the minds, actions, and ſucceſſes of men were according to their names, genius, and fate. Thus

Panormitan, *ex bono nomine oritur bona præſumptio;* and the common proverb, *Bonum nomen bonum omen:* and hence the foundation of the ononomantia. See ONOMOMANTIA.

It is an obſervation deſerving attention, ſays the Abbé Barthelemi, that the greater part of names found in Homer are marks of diſtinction. They were given in honour of the qualities moſt eſteemed in the heroic ages. From the word *polemos*, which ſignifies war, have been formed *Tlepolemus* and *Archeptolemus*, the names of two heroes mentioned in the Iliad. The former name ſignifies *able to ſupport*, and the latter, *able to direct, the labours of war*. By adding to the word *mache*, or *battle*, certain prepoſitions and different parts of ſpeech, which modify the ſenſe in a manner always honourable, are compoſed the names *Amphimachus*, *Antimachus*, *Promachus*, *Telemachus*. Proceeding in the ſame way with the word *honorea*, "ſtrength or intrepidity," they formed the names *Agapenor*, "he who eſteems valour;" *Agenor*, "he who directs it." From *thoes*, "ſwift," are derived *Alcathoos*, *Panthoes*, *Perithoes*, &c. From *nous*, "mind or intelligence," come *Aſtynoes*, *Arſinoes*, *Autenoes*, &c. From *medes*, "counſel," *Agamedes*, *Eumedes*, *Lycomedes*, *Thraſymedes;* and from *cleos*, "glory," *Amphicles*, *Agacles*, *Iphicles*, *Patroclus*, *Cleobulus*, with many others.

Hence Camden takes it for granted, that the names, in all nations and languages, are ſignificative, and not ſimple ſounds for mere diſtinction ſake. This holds not only among the Jews, Greeks, Latins, &c. but even the Turks; among whom, Abdalla ſignifies *God's ſervant;* Soliman, *peaceable;* Mahomet, *glorified*, &c. And the ſavages of Hiſpaniola, and throughout America, who, in their languages, name their children, *Gliſtering Light*, *Sun Bright*, *Fine Gold*, *&c.;* and they of Congo, by the names of precious ſtones, flowers, &c.

To ſuppoſe names given without any meaning, however by the alternation of languages their ſignification may be loſt, that learned author thinks is to reproach our anceſtors; and that contrary to the ſenſe of all ancient writers. Porphyry notes, that the barbarous *names*, as he calls them, were very emphatical, and very conciſe: and accordingly it was eſteemed a duty to be ἐπώνυμοι, or *ſui nominis homines:* as Severus, Probus, and Aurelius, are called *ſui nominis imperatores*.

It was the uſual way of giving names, to wiſh the children might diſcharge their names. Thus when Gunthram king of France named Clotharius at the font, he ſaid, *Creſcat puer, & hujus ſit nominis executor*.

The ancient Britons, Camden ſays generally took their names from colours, becauſe they painted themſelves; which names are now loſt, or remain hid among the Welſh. When they were ſubdued by the Romans, they took Roman names, ſome of which ſtill remain, corrupted: though the greateſt part became extinct upon the admiſſion of the Engliſh Saxons, who introduced the German names, as *Cridda*, *Penda*, *Oſwald*, *Edward*, &c.—The Danes, too, brought with them their names; as *Suayne*, *Harold*, *Knute*, &c. The Normans, at the Conqueſt, brought in other German names, as originally uſing the German tongue: ſuch as *Robert*, *William*, *Richard*, *Henry*, *Hugh*, &c. after the ſame manner as the Greek names: *Aſpyſius*, *Boethius*, *Symmachus*, &c. were introduced into Italy upon the diviſion of the empire, After the Conqueſt, our nation, which had ever been averſe to foreign names, as deeming them unlucky, began to take Hebrew names; as *Matthew*, *David*, *Sampſon*, &c. The various names anciently or at preſent obtaining among us, from what language or people ſoever borrowed, are explained by Camden in his Remains. As to the period when names began to be multiplied, and ſurnames introduced, &c. ſee SURNAME.

Of late years it has obtained among us to give ſurnames for Chriſtian names; which ſome diſlike, on account of the confuſion it may introduce. Camden relates it as an opinion, that the practice firſt began in the reign of Edward VI. by ſuch as would be godfathers, when they were more than half fathers. Upon which ſome were perſuaded to change their names at confirmation; which, it ſeems, is uſual in other countries.—Thus, two ſons of Henry II. of France, chriſtened *Alexander* and *Hercules*, changed them at confirmation into *Henry* and *Francis*, In monaſteries, the religious aſſume new names at their admittance, to ſhow they are about to lead a new life, and have renounced the world, their family, and even their name: *v. g.* ſiſter Mary *of the incarnation*, brother Henry *of the Holy Sacrament*, &c. The popes alſo changed their names at their exaltation to the pontificate; a cuſtom firſt introduced by pope Sergius, whoſe name till then, as Platina informs us, was *Swineſnout*. But Onuphrius refers it to John XII. or XIII. and at the ſame time adds a different reaſon for it from that of Platina, viz. That it was done in imitation of St Peter and St Paul, who were firſt called *Simon* and *Saul*.

Among the ancients, thoſe deified by the Heathen conſecrations had new names given them; as Romulus was called *Quirinus;* Melicertes, *Portunus* or *Portumnus*, &c.

New names were alſo given in adoptions, and ſometimes by teſtament: thus L. Æmilius, adopted by Scipio, took the name of *Scipio Africanus;* and thus Auguſtus, who at firſt was called *C. Octavius Thurinus*, being adopted by the teſtament of Julius Cæſar into his name and family, took the name of *Caius Julius Cæſar Octavianus*.

Names were alſo changed at enfranchiſements into new cities. Thus Lucumo, at his firſt being made free of Rome, took the name *Lucius Tarquinius Priſcus*, &c.; and ſlaves, when made free, uſually aſſumed their maſters names. Thoſe called to the equeſtrian order, if they had baſe names, were always new named, *nomine ingenuorum veterumque Romanorum*. And among the primitive Chriſtians, it was the practice to change the names of the catechumens: Thus the renegado Lucianus, till his baptiſm, was called *Lucius*.

Toward the middle of the 15th century, it was the fancy of the wits and learned men of the age, particularly in Italy, to change their baptiſmal names for claſſical ones. As Sanazarius, for inſtance, who altered his own plain name *Jacopo* to *Actius Syncerus*. Numbers did the ſame, and among the reſt Platina the hiſtorian at Rome, who, not without a ſolemn ceremonial,

remonial, took the name of *Callimachus* inſtead of *Philip*. Pope Paul II. who reigned about that time, unluckily chanced to be ſuſpicious, illiterate, and heavy of comprehenſion. He had no idea that perſons could wiſh to alter their names unleſs they had ſome bad deſign, and actually ſcrupled not to employ impriſonment and other violent methods to diſcover the fancied myſtery. Platina was moſt cruelly tortured on this frivolous account: he had nothing to confeſs; ſo the pope, after endeavouring in vain to convict him of hereſy, ſedition, &c. releaſed him after a long impriſonment.

NAMPTWICH, or Nantwich, a town of Cheſhire in England, ſituated on the Weever river, 14 miles S. E from Cheſter and 162 miles from London. It lies in the Vale-Royal, and is one of the largeſt and beſt built town in the county, the ſtreets being very regular, and adorned with many gentlemens houſes. The inhabitants drive a trade, not only by its large market on Saturday for corn and cattle, and its great thoroughfare to Ireland, but by its cheeſe and its fine white ſalt, which are made here to the greateſt perfection: and by ſhoes made here and ſent to London to the warehouſes. It is governed by a conſtable, &c. who are guardians of the ſalt-ſprings It is divided by the Weever into two equal parts, which is not navigable any farther than Winsford bridge. The Cheſter canal, lately completed, terminates in a handſome broad baſon near this place. In this town were ſeveral religious foundations, now no more. The church is a handſome pile of building in the form of a croſs, with an octangular tower in the middle. There are here three fairs.

NAMUR, a province of the Netherlands, lying between the rivers Sambre and Maeſe; bounded on the north by Brabant, on the eaſt and ſouth by the biſhopric of Leige, and on the weſt by Hainault. It is pretty fertile, has ſeveral foreſts, marble quarries, and mines of iron, lead, and pit-coal; and is about 30 miles long and 20 broad. Namur is the capital town.

Namur, a large, rich, and very ſtrong town of the Netherlands, capital of the county of Namur, with a ſtrong caſtle, ſeveral forts, and a biſhop's ſee. The moſt conſiderable forts are, Fort-William, Fort Maeſe, Fort Coquelet, and Fort-Eſpinor. The caſtle is built in the middle of the town, on a craggy rock. It was beſieged by king William in 1695, who took it in the ſight of an army of 100,000 French, though there were 60,000 men in garriſon. Namur is now a barrier-town, and has a Dutch garriſon. It was ceded to the houſe of Auſtria in 1713, but taken by the French in 1746; and reſtored by the treaty of Aix-la-Chapelle. It is ſituated between two mountains, at the confluence of the rivers Maeſe and Sambre, in E. Long. 4. 57. N. Lat. 50. 25.

NAN-tchang-fou, the capital of Kiang-ſi, a province of China. This city has no trade but that of porcelain, which is made in the neighbourhood of Jao-tcheou. It is the reſidence of a viceroy, and comprehends in its diſtrict eight cities; ſeven of which are of the third claſs, and only one of the ſecond. So much of the country is cultivated, that the paſtures left are ſcarcely ſufficient for the flocks.

NANCI, a town of France, and capital of Lorrain, is ſituated on the river Meuſe, in the centre of the province. It is divided into the Old and New Town. The firſt, though irregularly built, is very populous, and contains the ducal palace; the ſtreets of the New Town are as ſtraight as a line, adorned with handſome buildings, and a very fine ſquare. The primatial church is a magnificent ſtructure, and in that of the Cordeliers are the tombs of the ancient dukes. The two towns are ſeparated by a canal; and the new town was very well fortified, but the king of France has demoliſhed the fortifications. It has been taken and retaken ſeveral times; particularly by the French, to whom it was ceded in 1736, to enjoy it after the death of Staniſlaus.

NANI (John-Baptiſt), was born in 1616. His father was procurator of St. Mark, and ambaſſador from Venice to Rome. He was educated with attention, and made conſiderable improvement. Urban VIII. a juſt valuer of merit, ſoon perceived that of young Nani. He was admitted into the college of ſenators in 1641, and was ſhortly after nominated ambaſſador in France, where he ſignalized himſelf by his compliant manners. He procured conſiderable ſuccours for the war of Candia againſt the Turks: and became, after his return to Venice, ſuperintendant of the war office and of finances. He was afterwards ambaſſador to the empire; where he rendered thoſe ſervices to his country which, as a zealous and intelligent citizen, he was well qualified to diſcharge. He was again ſent into France in 1660 to ſolicit freſh ſuccours for Candia; and on his return was appointed procurator of St Mark. He died November 5, 1678, at the age of 63, much regretted by his countrymen. The ſenate had appointed him to write the Hiſtory of the Republic; which he executed to the ſatisfaction of the Venetians, although the work was leſs admired by foreigners, who were not proper judges of the accuracy with which he ſtated the facts, of the purity of his diction, nor of the ſimplicity of his ſtyle; although it muſt be acknowledged that his narrative is much interrupted by too frequent parentheſes. In writing his hiſtory of Venice he has given an univerſal hiſtory of his times, eſpecially with reſpect to the affairs of the French in Italy. This hiſtory which is continued from 1613 to 1671, was printed at Venice in 2 vols 4to, in the years 1662 and 1679.

NAN-king, a city of China, and capital of the province of King-nan, is ſaid to have been formerly one of the moſt beautiful and flouriſhing cities in the world. When the Chineſe ſpeak of its extent they ſay, if two horſemen ſhould go out by the ſame gate, and ride round it on full ſpeed, taking different directions, they would not meet before night. This account is evidently exaggerated; but it is certain, that Nanking ſurpaſſes in extent all the other cities of China. We are aſſured that its walls are five leagues and a half in circumference.

This city is ſituated at the diſtance of a league from the river Yang-tſe-kiang; it is of an irregular figure: the mountains which are within its circumference having prevented its being built on a regular plan. It was formerly the imperial city; for this reaſon it was called *Nan-King*, which ſignifies, "the Southern

Nan-king, Nansio.

Court:" but since the six grand tribunals have been transfered from hence to Peking, it is called *Kiang-ning* in all the public acts.

Nan-king has lost much of its ancient ſplendour: it had formerly a magnificent palace, not a veſtige of which is now to be ſeen; an obſervatory, at preſent neglected, temples, tombs of the emperors, and other ſuperb monuments, of which nothing remains but the remembrance. A third of the city is deſerted, but the reſt is well inhabited. Some quarters of it are extremely populous and full of buſineſs; particularly the manufacture of a ſpecies of cotton cloth, of which great quantities are imported into Europe under the name of *Nankin*. The ſtreets are not ſo broad as thoſe of Peking; they are, however, very beautiful, well-paved, and bordered with rich ſhops.

In this city reſides one of thoſe great mandarins, called *Tſong-tou*, who takes cogniſance of all important affairs, not only of both the governments of the province, but alſo of thoſe of the province of Kiang-ſi. The Tartars have a numerous garriſon here, commanded by a general of their own nation; and they occupy a quarter of the city, ſeparated from the reſt by a plain wall.

The palaces of the mandarins, whether Chineſe or Tartars, are in this city neither larger nor better built than theſe in the capital cities of other provinces. Here are no public edifices correſponding to the reputation of ſo celebrated a city, excepting its gates, which are very beautiful, and ſome temples, among which is the famous porcelain tower. It is 200 feet high, and divided into nine ſtories by plain boards within, and without by cornices and ſmall projections covered with green varniſhed tiles. There is an aſcent of 40 ſteps to the firſt ſtory; between each of the others there are 21.

The breadth and depth of the river Yang-tſe-kiang formerly rendered the port of Nan-king very commodious; but at preſent large barks, or rather Chineſe junks, never enter it; whether it be that it is ſhut up by ſand banks, or that the entrance of it has been forbid, in order that navigators may inſenſibly loſe all knowledge of it.

In the Months of April and May a great number of excellent fiſh are caught in this river near the city, which are ſent to court; they are covered with ice, and tranſported in that manner by barks kept entirely on purpoſe. Although this city is more than 200 leagues from Peking, theſe boats make ſuch expedition, that they arrive there in eight or nine days. This city, though the capital of the province, has under its particular juriſdiction only eight cities of the third order. The number of its inhabitants are ſaid to be 1,000,000, without comprehending the garriſon of [illegible] men. E. Long. 119. 25. N. Lat. 32. 46.

NANSIO, an iſland of the Archipelago, a little to the north of the iſland of Santorino, 16 miles in circumference; but has no harbour. The mountains are nothing but bare rocks, and there are not ſprings ſufficient to water the fields. There are a vaſt number of patridges, whoſe eggs they deſtroy every year to preſerve the corn, and yet vaſt numbers of them are always produced. The ruins of the temple of Apollo are yet to be ſeen, and conſiſt chiefly of marble columns, E. Long. 26. 20. N. Lat. 36. 15.

Nantes, Napæa.

NANTES, an ancient, rich, and very conſiderable town of France, in Bretagne, with a biſhop's ſee, an univerſity, and a mint. It is one of the moſt conſiderable places in the kingdom; contains the richeſt merchants: and was formerly the reſidence of the dukes of Bretagne, where they built a very ſtrong caſtle on the ſide of the river, and which is ſtrongly fortified. There are ſeveral pariſhes, and a great many religious houſes, and the cathedral contains the tombs of the ancient dukes. There are ſeveral fine bridges over the river Loire, which is navigable. The ſuburbs are ſo large, on account of the number of people that come from all parts to ſettle here, that they exceed the city. The Spaniards trade here, with wine, fine wool, iron, ſilk, oil, oranges, and lemons: and they carry back cloth, ſtuffs, corn, and hard-ware. The Dutch ſend hither [illegible], and all ſorts of ſpices: and in return have wine and brandy. The Swedes bring copper; and the Engliſh lead, tin, and pit-coal. It was in this place that Henry IV. promulgated the famous edict in 1598, called the *Edict of Nantes*, and which was revoked in 1685. Nantes was anciently, like almoſt every conſiderable city in Europe, very ſtrongly fortified. Peter de Dreux, one of the dukes of Bretagne, ſurrounded it with walls, which have only been demoliſhed within theſe few years. The bridge is an object of curioſity, being near a mile and a half in length, being continued acroſs all the little iſlands in the Loire, from north to ſouth. The territory of Nantes lies on both ſides the Loire, and feeds a great number of cattle. Large veſſels can come no higher than Port Launai, which is 12 miles from Nantes. W. Long. 1. 31. N. Lat. 47. 13.

MANTUEIL (Robert), the celebrated deſigner and engraver to the cabinet of Louis XIV. was born at Rheims in 1630. His father, though but a petty ſhopkeeper, gave his ſon a liberal education; who having a taſte for drawing, cultivated it with ſuch ſucceſs, that he became the admiration of the whole town: but marrying young, and not being able to maintain his family he took a journey to Paris, where he made his talents known by a ſtratagem.—Seeing ſeveral abbés at the door of an eating houſe, he aſked the miſtreſs for an eccleſiaſtic of Rheims, whoſe name he had forgot, but that ſhe might eaſily know him by a picture of him which he ſhowed: the abbés crowding round, were ſo charmed with it, that he ſeized the opportunity of offering to draw any of their pictures for a ſmall matter. Cuſtomers came ſo faſt, that he ſoon raiſed his price, and brought himſelf [illegible] Paris, where his reputation was quickly eſtabliſhed. He applied himſelf particularly to taking portraits in crayons, which he afterwards engraved to the admiration of the connoiſſeurs; and in this way he did the portrait of the king, and afterwards engraved it as big as the life: a thing never before attempted. The king was ſo pleaſed with it, that he created the place of deſigner and engraver to the cabinet for him, with a penſion of 1000 livres. He died in 1678: and an entire collection of his prints amounts to upwards of 240.

NANTWICH. See NAMPTWICH.

NAPÆA, in botany: A genus of the polyandria order, belonging to the polydelphia claſs of plants: and in the natural method ranking under the 37th order, *Columniferæ*. The calyx is ſingle and cylindric

the

Naphtha.

the arilli coalited and monoſpermous. There are two ſpecies; both of them with perennial roots, compoſed of many thick fleſhy fibres, which ſtrike deep into the ground, and are connected at the top into large heads; the ſtalks grow to ſeven or eight feet high, producing white flowers, tubulous at bottom, but ſpreading open at top, and dividing into five obtuſe ſegments. Both theſe plants are natives of Virginia and other parts of North America: from the bark of ſome of the Indian kinds a ſort of fine hemp might be procured, capable of being woven into very ſtrong cloth. They are eaſily propagated by ſeed, which will thrive in any ſituation.

NAPHTHA, an inflammable ſubſtance of the bituminous kind, of a light brown colour, and incapable of decompoſition, though frequently adulterated with heterogeneous mixtures. By long keeping it hardens in the air into a ſubſtance reſembling a vegetable reſin; and in this ſtate it is always of a black colour, whether pure or mixed with other bodies. According to Mongez, there are three kinds of naphtha, the white, reddiſh, and green or deep-coloured; and it is in fact a true petrol or rock oil, of which the lighteſt and moſt inflammable is called *naphtha*. It is ſaid to be of an extremely fragrant and agreeable ſmell though very different in this reſpect from vegetable oils. It is alſo tranſparent, extremely inflammable, diſſolves reſins and balſams, but not gum-reſins nor elaſtic gum. It diſſolves in the eſſential oils of thyme and lavander, but is inſoluble in ſpirit of wine and ether. It burns with a bluiſh flame, and is as inflammable as ether, like which it alſo attracts gold from aqua-regia.

Naphtha, according to Cronſtedt, is collected from the ſurface of ſome wells in Perſia; but Mr Kirwan informs us, that it iſſues out of white, yellow, or black clays, in Perſia and Media. The fineſt is brought from a peninſula in the Caſpian Sea, called by Kempfer, *okefra*. It iſſues out through the earth into ciſterns and wells, purpoſely excavated for collecting it at Baku in Perſia. Different kinds of this ſubſtance are alſo found in Italy, in the duchy of Modena, and in Mount Ciaro, 12 leagues from Plaiſance.

The formation of naphtha and petroleum is by moſt naturaliſts and chemiſts aſcribed to the decompoſition of ſolid bitumens by the action of ſubterraneous fires; naphtha being the lighteſt oil, which the fire diſengages firſt; what follows gradually acquiring the colour and conſiſtence of petrol. Laſtly, the petroleum, united with ſome earthy ſubſtances, or altered by acids, forms the appearance of mineral pitch, piſſaſphaltum, &c. This opinion ſeems to be ſupported by the phenomena attending the diſtillation of amber; where the firſt liquor that riſes is a true naphtha; then a petroleum of a more or leſs brown colour; and laſtly, a kind of ſubſtance like tar, which being further urged by the fire leaves a dry friable matter, &c. It is further obſerved that nature frequently produces all the different kinds of petroleum near one another; of which we have an inſtance at Mount Teſtin in the duchy of Modena in Italy. Some, however, are of opinion, that theſe mineral oils or bitumens are formed from the vitriolic acid, and various oily and fat ſubſtances found in the bowels of the earth.

Nephthali
Napier.

NAPHTHALI, or Nephthali (*Joſh.* xix.), one of the tribes of Iſrael; having Zabulon on the ſouth, Aſher on the weſt, the Jordan on the eaſt, and on the north Antilibanus.

NAPIER (John), baron of Merchiſton, in Scotland, inventor of the logarithms, was the eldſt ſon of Sir Archibald Napier of Merchiſton, and born in the year 1550. Having given early diſcoveries of great natural parts, his father was careful to have them cultivated by a liberal education. After going through the ordinary courſes of philoſophy at the univerſity of St Andrew's, he made the tour of France, Italy, and Germany. Upon his return to his native country, his literature and other fine accompliſhments ſoon rendered him conſpicuous, and might have raiſed him to the higheſt offices in the ſtate; but declining all civil employments, and the buſtle of the court, he retired from the world to purſue literary reſearches, in which he made an uncommon progreſs, ſo as to have favoured mankind with ſundry uſeful diſcoveries. He applied himſelf chiefly to the ſtudy of mathematics; but at the ſame time he did not neglect that of the Holy Scriptures. In both theſe he hath diſcovered the moſt extenſive knowledge and profound penetration. His eſſay upon the book of the Apocalypſe, indicates the moſt acute inveſtigation, and an uncommon ſtrength of judgment; though time hath diſcovered, that his calculations concerning particular events had proceeded upon fallacious data. This work has been printed abroad in ſeveral languages; particularly in French at Rochelle in the year 1693, 8vo, announced in the title as reviſed by himſelf. Nothing, ſays lord Buchan, could be more agreeable to the Rochellers or to the Huguenots of France at this time, than the author's annunciation of the pope as antichriſt, which in this book he has endeavoured to ſet forth with much zeal and erudition.—But what has principally rendered his name famous, was his great and fortunate diſcovery of logarithms in trigonometry, by which the eaſe and expedition in calculation have ſo wonderfully aſſiſted the ſcience of aſtronomy and the arts of practical geometry and navigation. That he had begun about the year 1593 the train of enquiry which led him to that great atchievement in arithmetic, appears from a letter to Crugerus from Kepler in the year 1624; wherein, mentioning the *Canon Mirificus*, he writes thus: "Nihil autem ſupra Neperianam rationem eſſe puto: etſi Scotus quidem literis ad Tychonem, anno 1594, ſcriptis jam ſpem fecit Canonis illius mirifici;" which alluſion agrees with the idle ſtory mentioned by Wood in his *Athenæ Oxon.* and explains it in a way perfectly conſonant to the rights of Napier as the inventor.

When Napier had communicated to Mr Henry Briggs, mathematical profeſſor in Gresham college, his wonderful canon for the logarithms, [illegible] ſet himſelf [illegible] *[illegible]*; and in a letter to [illegible], in the year 1615, he writes thus: "Napier, baron of Merchiſton, hath ſet my head and hands at work with his new and admirable logarithms. I hope to ſee him this ſummer if it pleaſe God; for I never ſaw a book which pleaſed me better, and made me more wonder." [illegible] the life of Lilly [illegible] by lord Buchan as giving a pic-

reſpe

reſque view of the meeting betwixt Brigs and the inventor of the logarithms at Merchiſton near Edinburgh. "I will acquaint you (ſays Lilly) with one memorable ſtory related unto me by John Marr, an excellent mathematician and geometrician, whom I conceive you remember. He was ſervant to king James I. and Charles I. When Merchiſton firſt publiſhed his logarithms, Mr Briggs, then reader of the aſtronomy lectures at greſhham college in London, was ſo much ſurpiſed with admiration of them, that he could have no quietneſs in himſelf until he had ſeen that noble perſon whoſe only invention they were: he acquaints John Marr therewith, who went into Scotland before Mr Briggs, purpoſely to be there when theſe two ſo learned perſons ſhould meet. Mr Briggs appoints a certain day when to meet at Edinburgh; but failing thereof, Merchiſton was fearful he would not come. It happened one day as John Mar and the baron Napier were ſpeaking of Mr Briggs; 'Ah, John (ſaid Merchiſton), Mr Briggs will not now come.' At the very inſtant one knocks at the gate; John Marr haſted down, and it proved to be Mr Briggs to his great contentment. He brings Mr Briggs up to the Baron's chamber, where almoſt one quarter of an hour was ſpent, each beholding the other with admiration before one word was ſpoken. At laſt Mr Briggs began: 'Sir, I have undertaken this long journey purpoſely to ſee your perſon, and to know by what engine of wit or ingenuity you came firſt to think of this moſt excellent help into aſtronomy, *viz.* the logarithms; but Sir, being by you found out, I wonder nobody elſe found it out before, when now being known it appears ſo eaſy.' He was nobly entertained by baron Napier; and every ſummer after that, during the laird's being alive, this venerable man Mr Briggs went purpoſely to Scotland to viſit him."

Earl of Buchan's Account of the Writings and Inventions of Napier of Merchiſton.

There is a paſſage in the life of Tycho Brahe by Gaſſendi which may miſlead an attentive reader to ſuppoſe that Napier's method had been explored by Herwart at Hoenburg: It is in Gaſſendi's Obſervations on a Letter from Tycho to Herwart of the laſt day of Auguſt 1599. "Dixit Hervartus nihil morari ſe ſolvendi cujuſquam trianguli difficultatem; ſol re ſe enim multiplicationum, ac diviſionum vice additiones ſolum, ſubtractiones 93 uſurpare (qhod ut fieri poſſet, docuit poſtmodum ſuo Logarithmorum Canone Neperus.)" But Herwart here alludes to his work afterwards publiſhed in the year 1610, which ſolves triangles by proſtaphæreſis; a mode totally different from that of the logarithms.

Kepler dedicated his *Ephemerides* to Napier, which were publiſhed in the year 1617; and it appears from many paſſages in his letter about this time that he held Napier to be the greateſt man of his age in the particular department to which he applied his abilities. "And indeed (ſays our noble biographer), if we conſider that Napier's diſcovery was not like thoſe of Kepler or of Newton, connected with any analogies or coincidences which might have led him to it, but the fruit of unaſſiſted reaſon and ſcience, we ſhall be vindicated in placing him in one of the higheſt niches in the temple of fame. Kepler had made many unſucceſsful attempts to diſcover his canon for the periodic motions of the planets, and hit upon it at laſt as he himſelf candidly owns on the 15th of May 1618: and Newton applied the palpable tendency of heavy bodies to the earth to the ſyſtem of the univerſe in general: but Napier ſought out his admirable rules by a ſlow ſcientific progreſs ariſing from the gradual evolution of truth."

The laſt literary exertion of this eminent perſon was the publication of his *Rabdology and Promptuary* in the year 1617, which he dedicated to the Chancellor Seton; and ſoon after died at Merchiſton on the 3d of April O. S. of the ſame year, in the 68th year of his age and 23d of his happy invention.—The particular titles of his publiſhed works are: 1. A plain diſcovery of the Revelation of St John. 2. *Mirifici ipſius canonis conſtructio et logarithmorum, ad naturales ipſorum numeros habitudines.* 3. *Appendix de alia atque præſtantiore logarithmorum ſpecie conſtruenda, in qua ſcilicet unitas logarithmus eſt.* 4. *Rhabdologiæ, ſeu numerationis per virgulas, libri duo.* 5. *Propoſitiones quædam eminentiſſimæ, ad triangula ſphærica mira facilitate reſolvenda.* To which may be added, 6. His Letter to Anthony Bacon (the orginal of which is in the archbiſhop's library at Lambeth), intitled "Secret inventions, profitable and neceſſary in theſe days for the defence of this iſland, and withſtanding ſtrangers enemies to god's truth and religion;" which the earl of Buchan has cauſed to be printed in the Apendix to his Account of Napier's Writings. This letter is dated June 2, 1596, about which time it appears the author had ſet himſelf to explore his logarithmic canon.

This eminent perſon was twice married. By his firſt wife, who was a daughter of Sir James Stirling of Keir, he had only one ſon named Archibald, who ſucceeded to the eſtate. By his ſecond wife, a daughter of Sir James Chiſholm of Cromlix, he had a numerous iſſue.—*Archibald Napier*, the only ſon of the firſt marriage, was a perſon of fine parts and learning. Having more a turn to public buſineſs than his father had, he was raiſed to be a privy counſellor by James VI. under whoſe reign he alſo held the offices of treaſurer-depute, juſtice-clerk, and ſenator of the college of juſtice. By Charles I. he was raiſed to the peerage by the title of *Lord Napier*.

Napier's Rods, or *Bones*, an inſtrument invented by Baron Napier, whereby the multiplication and diviſion of large numbers is much facilitated.

As to the Conſtruction of Napier's Rods: Suppoſe the common table of multiplication to be made upon a plate of metal, ivory, or paſteboard, and then conceive the ſeveral columns (ſtanding downwards from the digits on the head) to be cut aſunder: and theſe are what we call *Napier's rods for Multiplication*. But then there muſt be a good number of each; for as many times as any figure is in the multiplicand, ſo many rods of that ſpecies (*i. e.* with that figure on the top of it) muſt we have; though ſix rods of each ſpecies will be ſufficient for any example in common affairs; there muſt be alſo as many rods of o's.

But before we explain the way of uſing theſe rods, there is another thing to be known, *viz.* that the figures on every rod are written in an order different from that in the table. Thus the little ſquare ſpace or diviſion in which the ſeveral products of every column are written, is divided into two parts by a line acroſs from the upper angle on the right to the lower on the left; and if the product is a digit it is ſet in the lower diviſion; if it has two places, the firſt is ſet in the lower, and the ſecond in the upper diviſion; but the ſpaces on the top are not divided; alſo there is a rod of digits, not divided, which is called the *index rod*, and of this we need but one ſingle rod. See the figure of all the different rods, and the index, ſeparate from one another, in Plate CCCXLIV.

Multiplication by Napier's Rods. Firſt lay down the index-rod; then on the right of it ſet a rod, whoſe top is the figure in the higheſt place of the multiplicand: next to this again, ſet the rod whoſe top is the next figure of the multiplicand; and ſo on in order to the firſt figure. Then is your multiplicand tabulated for all the nine digits; for in the ſame line of ſquares ſtanding againſt every figure of the index-rod, you have the product of that figure; and therefore you have no more to do but to transfer the products and ſum them. But in taking out theſe products from the rods, the order in which the figures ſtand obliges you to a very eaſy and ſmall addition: thus, begin to take out the figure in the lower part, or units place, of the ſquare of the firſt rod on the right; and the figure in the upper part of this rod to that in the lower part of the next, and ſo on; which may be done as faſt as you can look on them. To make this practice as clear as poſſible, take the following example.

Example: To multiply 4768 by 385. Having ſet the rods together for the number 4768 *(ibid.* n° 2.) againſt 5 in the index, I find this number, by adding

according to the rule,	-	-	23840
Againſt 8, this number	-	-	38144
Againſt 3, this number	-	-	14304
Total product	-	-	1835680

To make the uſe of the rods yet more regular and eaſy, they are kept in a flat ſquare box, whoſe breadth is that of ten rods, and the length that of one rod, as thick as to hold ſix (or as many as you pleaſe) the capacity of the box being divided into ten cells, for the different ſpecies of rods. When the rods are put up in the box (each ſpecies in its own cell diſtinguiſhed by the firſt figure of the rod ſet before it on the face of the box near the top), as much of every rod ſtands without the box as ſhows the firſt figure of that rod: alſo upon one of the flat ſides without and near the edge, upon the left hand, the index rod is fixed; and along the foot there is a ſmall ledge; ſo that the rods when applied are laid upon this ſide, and ſupported by the ledge which makes the practice very eaſy; but in caſe the multiplicand ſhould have more than nine places, that upper face of the box may be made broader. Some make the roads with four different faces, and figures on each for different purpoſes.

Diviſion by Napier's Rods. Firſt tabulate your diviſor; then you have it multiplied by all the digits, out of which you may chooſe ſuch convenient diviſors as will be next leſs to the figures in the dividend, and write the index anſwering in the quotient, and ſo continually till the work is done. Thus 2179788, divided by 6123, gives in the quotient 356.

Having tabulated the diviſor 6123, you ſee that 6123 cannot be had in 2179; therefore take five places, and on the rods find a number that is equal or next leſs to 21797, which is 18699; that is, 3 times the diviſor: wherefore ſet 3 in the quotient, and ſubtract 18369 from the figures above, and there will remain 3428; to which add 8, the next figure of the dividend, and ſeek again on the rods for it, or the next leſs, which you will find to be five times; therefore ſet 5 in the quotient, and ſubtract 30615 from 34288, and there will remain 3673; to which add 8, the laſt figure in the dividend, and finding it to be juſt 6 times the diviſor, ſet 6 in the quotient.

6123)2179788(356
18369··

34288
30165

36738
36738

00000

NAPLES, a kingdom of Italy, comprehending the ancient countries of Samnium, Campania, Apulia, and Magna Græcia. It is bounded on all ſides by the Mediterranean and Adriatic, except on the north-eaſt, where it terminates on the Eccleſiaſtical ſtate. Its greateſt length from ſouth-eaſt to north-weſt is about 280 Engliſh miles; and its breadth from north-eaſt to ſouth-weſt, from 96 to 120.

The ancient hiſtory of this country falls under the articles ROME and ITALY; the preſent ſtate of it, as well as of the reſt of Italy, is owing to the conqueſts of Charlemagne. When that monarch put an end to the kingdom of the Lombards, he obliged the dukes of Friuli, Spoleto, and Benevento, to acknowledge him as king of Italy; but allowed them to exerciſe the ſame power and authority which they had enjoyed before his conqueſt. Of theſe three dukedoms Benevento was by far the moſt powerful and extenſive, as it comprehended almoſt all the preſent kingdom of Naples; that part of Farther Calabria beyond the rivers Savuto and Peto, a few maritime cities in Hither Calabria, with the city of Acripoli, and the promontory in its neighbourhood called *Capo di Licoſa;* and laſtly, the dukedoms of Gaeta, Naples, and Amalfi, which were very inconſiderable, and extended along the ſhore only about 100 miles, and were interrupted by the Gaſtaldate or county of Capua.

1
Extent of the duchy of Benevento.

2
Arechis duke of Benevento revolts from Charlemagne.

This flouriſhing and extenſive dukedom was at this time governed by Arechis, who had married one of the daughters of the laſt king of the Lombards, and had ſubmitted, and taken the oath of allegiance to the emperor Charles. However, a few years after, he renounced his allegiance to the Franks, declared himſelf an independent ſovereign, and was acknowledged as ſuch by all the inhabitants of his duchy. To ſtrengthen himſelf againſt Pepin king of Italy, who reſided at Ravenna, he enlarged and fortified the city of Benevento, and likewiſe built Salerno on the ſea coaſt ſurrounding it with a very ſtrong and high wall. He engaged in ſeveral wars with the Greeks, whom he ſometimes obliged to give him hoſtages; but having invaded the territories of the pope, whom Pepin could not aſſiſt, Charlemagne was prevailed on to return to Italy. Arechis, unable to oppoſe ſuch a formidable enemy, ſent his eldeſt ſon, Romauld, to Rome, with an offer of ſubmiſſion: but, at the inſtigation of the pope, Charles refuſed the offer, and detained his son prisoner; after which he ravaged the country, and made himself master of Capua. Other attempts, however proved more successful; and in the year 787, a peace was concluded on these conditions: That Arechis and the Beneventans should renew their allegiance to the Franks: that he should pay a yearly tribute to Pepin: deliver up all his treasure; and give his son Grimoald and his daughter Adelgisa, with twelve others, as hostages for his fidelity: however after many intreaties, Adelgisa was restored to her father.

3 Submits.

4 Revolts a second time.

Charles had no ſooner left Italy, than Arechis forgot all his engagements, and began to negociate with Irene, empreſs of Conſtantinople, and her ſon Conſtantine, for expelling the Franks out of Italy. For himſelf, he deſired the honour of patriciate, and the dukedom of Naples with all its dependencies; and, in return, promiſed to acknowledge the Greek emperor as his ſovereign, and to live after the manner of the Greeks. He required, however, to be ſupported by a Greek army; and that his brother-in-law Adalgiſus, ſon to Deſiderius the laſt king of the Lombards, ſhould be ſent over into Italy, to raiſe a party among his countrymen. Theſe conditions were readily accepted, on condition that prince Romuald ſhould be ſent as an hoſtage; ambaſſadors were ſent to Naples with the enſigns of the patrician order, namely the mantle of cloth of gold, the ſword, the comb, and the ſandals; but before the ceremony could be performed, prince Romuald died, and ſoon after him his father: whoſe death was ſuppoſed to have been haſtened by that of his ſon.

5 Grimoald continues for ſome time faithful to the Franks.

After the death of Arechis, the Beneventans ſent a moſt ſubmiſſive embaſſy to Charlemagne, intreating him to ſend them Grimoald, the late king's ſon, and only lawful heir to his crown; threatening at the ſame time to revolt if their prince was denied them. Charles readily granted their requeſt, and allowed Grimoald to depart, after he had agreed to the following conditions, viz. That he ſhould oblige the Lombards to ſhave their beards; that in writings, and on money, the name of the king ſhould be put before that of the prince; and that he ſhould cauſe the walls of Salerno, Acerenza, and Conſia, to be entirely demoliſhed.—The new king was received by his ſubjects with the utmoſt joy; and for ſome time continued faithful to his engagements, excepting only the laſt article, which he either neglected or eluded. So far, however, was he from aſſiſting the Greeks, that he gave notice of their machinations to Pepin king of Italy; raiſed an army to oppoſe his uncle Adalgiſus; and being joined by Hildebrand duke of Spoleto, and Vinigiſe the general of Pepin, he attacked the Greeks in Calabria ſoon after they had landed, entirely defeated and took his uncle priſoner, and, as is ſaid, put him to a cruel death. Yet in a ſhort time Grimoald contracted an alliance with the Greek emperor by marrying his niece Wanzia; and in the fifth year of his reign a war broke out between him and Pepin, which continued for twelve years; at the end of which time a truce was concluded. Grimoald ſurvived this pacification only three years, and was ſucceded by his treaſurer Grimoald II. who ſubmitted to Charlemagne after the death of Pepin; and from this time the Beneventans were looked upon as tributaries of the weſtern emperors.

As yet, however, the city of Naples did not own allegiance to the dukes of Benevento, but was held by the eaſtern emperors; and frequent wars took place between the Beneventans and Neapolitans. This happened to be the caſe when Grimoald II. aſcended the throne. He concluded a peace with them; which however was of no long continuance; for Theodore, governor of Naples, having granted protection to Dauferius a noble Beneventan, who had been concerned in a conſpiracy againſt his prince, Grimoald marched againſt the city of Naples, and inveſted it by ſea and land. Theodore ſtill refuſed to deliver up the traitor, and a general engagement both by land and ſea was the conſequence; in which the Neapolitans were defeated with ſo great ſlaughter, that the ſea was ſtained with their blood for more than ſeven days. Theodore then conſented to deliver up Dauferius, with 8000 crowns for the expences of the war; and Grimoald not only pardoned Dauferius, but received him into favour; the traitor, however, reflecting on the heinouſneſs of his crime, was ſeized with remorſe; and went a pilgrimage to the holy land, carrying a large ſtone in his mouth, by way of penance, which he never took out but at his meals.

6 Is murdered, and ſucceeded by Sico.

In the year 821, Grimoald was murdered by Radelchis count of Conſia, and Sico gaſtald of Acerenta, the latter of whom ſucceeded to the dukedom of Benevento. Radelchis being ſoon after ſeized with remorſe, became a monk; while Sico aſſociated his ſon Sicardo with him in the government; and both, being of an ambitious and reſtleſs diſpoſition, ſought a pretence for attacking the Neapolitans. This was ſoon found, and the city was inveſted by ſea and land.

3 Naples beſieged by Sico;

The walls were furiouſly battered; and part of them being beat down, Sico prepared for a general aſſault. Stephen, at that time duke of Naples, pretended to ſubmit; but that he mght prevent the city from being pillaged, intreated Sico to put off his entry till the morning, and in the mean time ſent out his mother and his two children as hoſtages. Sico conſented to his requeſt; but next morning found the breach built up, and the Neapolitans prepared for their defence. Exaſperated at their perfidy, he renewed his attacks with vigour, but without any ſucceſs; the beſieged defending themſelves with the utmoſt obſtinacy. At laſt, perceiving that they ſhould not be able to hold out much longer, they conſented to a peace on the following conditions, viz. That the Neapolitans ſhould pay an annual tribute to the princes of Benevento, and conſent to the tranſporting of the body of St Januarius from his church without the walls of Naples to Benevento. Theſe conditions being ratified, Sico returned with great honour to Benevento; but ſoon after renewed the war, under pretence that the Neapolitans had neglected to pay the ſtipulated ſum; and hoſtilities continued till his death, which happened in 833.

8 And by his ſucceſſor Sicardo.

Sico was ſucceeded in the government of Benevento by his ſon Sicardo, who had married the daughter of Dauferius; and being influenced by the evil counſels of Roffrid his wife's brother, oppreſſed his ſubjects to ſuch a degree that they conſpired againſt his life. He beſieged Naples with a powerful army, and took poſſeſſion of Acerra and Atella, both of which he fortified. But Bonus, the Neapolitan duke, defended himſelf ſo vigorouſly, that the Beneventans were obliged to retire, and even to abandon Acerra and Atella, the fortifications of which were immediately demoliſhed. At laſt Sicardo agreed to a peace for five years, on the interceſſion of Lothaire, emperor, and king of Italy; but his chief motive was thought to have been the fear of the Saracens, whom the duke of Naples had called over from Africa to his aſſiſtance: for no ſooner were they ſent back than Sicardo attempted to delay the concluſion of the treaty: but the emperor interpoſing his authority, a peace was concluded in the year 836, after the war had continued. with very little intermiſſion, for 16 years.

9
The Saracens called in by the duke of Naples.

Soon after the concluſion of this peace, the Saracens landed at Brindiſi; and having made themſelves maſters of the place, ravaged all the neighbouring country, Sicardo marched againſt them with a numerous army; but the Saracens having dug a great number of ditches which they ſlightly covered over, found means to draw the Beneventans in among them, whereby they were repulſed with great loſs. However, Sicardo, having reinforced his army, marched again to attack them; but the Saracens, deſpairing of ſucceſs, pillaged and burnt Brindiſi, and then retired with their booty, and a great many captives, to Sicily. Sicardo then, without any apparent provocation, attacked the city of Amalfi, levelled its walls with the ground, carried off all its wealth, and the body of its tutelar ſaint Triphomen. A great many of the inhabitants were tranſported to Salerno: and by promoting alliances between the inhabitants of both places, he endeavoured to unite Amalfi to his own principality as firmly as poſſible.

During all theſe tranſactions, Sicardo had tyrannized over his ſubjects in ſuch a manner, that at laſt he became intolerable. Among other acts of injuſtice, he impriſoned his own brother Siconolphus; compelled him to turn prieſt; and afterwards ſent him bound to Tarento, where he cauſed him to be ſhut up in an old tower that had been built for a ciſtern. By ſuch acts of tyranny his nobles were provoked to conſpire againſt him; and in the year 839 he was murdered in his tent.

10
Sicardo, murdered by Radelchis, which brings on a civil war.

On the death of Sicardo, Radelchis, his ſecretary or treaſurer was unanimouſly elected prince of Benevento; but Siconolphus, the laſt king's brother, having regained his liberty, formed a great party againſt the new prince. Radelchis did not fail to oppoſe him with a formidable army: and a moſt ruinous civil war enſued. Both parties by turns called in the Saracens: and theſe treacherous allies acted ſometimes againſt one, and ſometimes againſt the other; or turned their arms againſt both, as ſeemed moſt ſuitable to their own intereſt. Thus the war continued with the utmoſt animoſity for 12 years, during which time the principality was almoſt entirely ruined: till at laſt the emperor Lewis interpoſed, and obliged the competitors to agree to a partition of the principality. By this treaty, Radelchis promiſed to acknowledge Siconolphus and his ſucceſſors as lawful princes of the principality of Salerno, which was declared to contain Tarento, Latiniano, Caſſano, Coſſenzo, Laino, Lucania, Conſia, Montella, Rota, Salerno, Sarno, Ciraterium Furculo, Capua, Feano, Sora, and the half of the Gaſtaldate of Acerenza, where it joins Latiano and Conſia. The boundery betwixt Benevento and Capua was fixed at St Angelo and Ceros; Alli Peregrini was made the boundary betwixt Benevento and Salerno, and Staſilo betwixt Benevento and Conſia. The monaſteries of Monte Caſſino and St Vincent were declared to be immediately under the protection of the emperor: both princes ſtipulated that no hoſtilities ſhould be committed by either againſt the ſubjects of each other; and promiſed to join their forces in order to drive out the Saracens. Soon after this pacification, however, both Radelchis and Siconolphus died; the former appointing his ſon Radelgarius, or Radelcar, to ſucceed him; and the latter leaving an infant ſon, Sico, to the care of his godfather, Peter.

11
The principality divided.

The war with the Saracens proved very unſucceſsful; neither the united efforts of the princes, nor the aſſiſtance of the emperor Lewis himſelf, being able to expel the infidels; and, in 854, Adelgiſe the ſecond ſon of Radelchis, who had now ſucceeded, on the death of his brother Radelcar, to the principality of Benevento, was obliged to pay them an annual ſubſidy. Two years after, Lando, Count of Capua, revolted from the prince of Salerno, and could not be reduced. In the mean time, Sico, the lawful prince of Salerno, had been poiſoned by Count Lando, and the principality uſurped by Ademarius, the ſon of Peter above mentioned; but in 861, Ademarius himſelf was ſeized and impriſoned by Gauferius, the ſon of Dauferius formerly mentioned. This was occaſioned by his cruelty and rapaciouſneſs, which entirely alienated the hearts of his ſubjects from him, and encouraged Gauferius to become the head of the conſpirators. The Saracens in the mean time committed terrible ravages throughout the Beneventan territories; which at laſt obliged Adelgiſe to enter into an alliance with Gauferius, and both together ſent a moſt humble embaſſy to the emperor Lewis, requeſting him to take them under his protection. About the ſame time an embaſſy arrived from Conſtantinople, propoſing a junction of the forces of the eaſtern and weſtern empires againſt the infidels; upon which Lewis gave orders for aſſembling a formidable army, But in the mean time Adelgiſe fell off from his alliance, and made peace with the Saracens; nay, according to ſome he encouraged them in their incurſions, and it was at his deſire that they invaded the duchy of Capua, and afterwards that of Naples, which they ravaged in a moſt barbarous manner. The Neapolitans in conjunction with the duke of Spoleto and the Count of Marſi, endeavoured to oppoſe them; but being defeated, the Saracens continued their ravages with redoubled fury, and retired to Bari, which was their capital city with an immenſe booty.

12
Unſucceſsful war with the Saracens.

In 866, Lewis arrived at Sora, with his army; and having marched to Capua, was there joined by Landulph, the biſhop and count, with a body of Capuans: but Landulph ſoon after perſuading his countrymen to deſert, Lewis marched againſt that city, which he took after a ſiege of three months, and almoſt totally deſtroyed. In the end of the year he was joined by Gauferius with his quota of troops, having ordered the eyes of Ademarius to be put out in his abſence. Lewis confirmed him in the principality, and marched with his army to Benevento, where Adelgiſe re-

ceived him with great reſpect. Having reduced ſome inconſiderable places belonging to the Saracens, Lewis ſoon after inveſted Bari; but as the Saracens received continual ſupplies from their countrymen ſettled in Sicily, and beſides were protected by the Neapolitans, he could not reduce the place till the year 871, though he had received conſiderable aſſiſtance from his brother
13 They are at laſt expelled.
Lotharius, and the Greek emperor had ſent him a fleet of 200 ſail. The expulſion of the Saracens was completed the ſame year by the taking of Tarento; after which the emperor returned with great glory to Benevento, reſolving next to carry his arms into Sicily, and expel the infields from thence alſo. But his future ſchemes of conqueſt were fruſtrated by a quarrel between him and Adelgiſe. The latter, pretending to have been inſulted by the empreſs, and oppreſſed by the French, ſeized the emperor himſelf, and kept him priſoner for 40 days. His impriſonment would probably have been of much longer continuance, had not
14 But ſoon return.
a body of Saracens arrived from Africa, who being joined by ſuch of their countrymen as had concealed themſelves in Italy, laid ſiege to Salerno with an army of 30,000 men, ravaging the neighbouring country at the ſame time with the utmoſt barbarity. By this new invaſion Adelgiſe was ſo much alarmed, that he ſet the emperor of liberty, but firſt obliged him to ſwear that he would not revenge the inſult that had been offered him, and that he would never return to Benevento. Lewis having then joined his forces to thoſe of the prince of Salerno, ſoon obliged the Saracens to raiſe the ſiege of Salerno; but though they were prevented from taking that city, they entirely deſtroyed the inhabitants of Calabria, leaving it, according to the expreſſion of one of the hiſtorians of that time, "as deſolate as it was at the flood."

In the year 873, Lewis being abſolved from his oath by the pope, went to Benevento, and was reconciled to Adelgiſe; but ſoon after this reconciliation he died, and the Saracens continued their ravages to ſuch a degree that the inhabitants of Bari were conſtrained to deliver up their city to the Greeks. At the ſame time, the Salernitans, Neapolitans, Cajetans, and Amalfitans, having made peace with the Saracens, were compelled to agree to their propoſal of invading the territories of the Roman pontiff. His holineſs exerted himſelf to the utmoſt, both with ſpiritual and tempo-
15 The pope becomes their tributary.
ral weapons, in order to defend his right; but was at laſt reduced to the neceſſity of becoming a tributary to the infidel, and promiſing to pay them a large ſum annually.

In the mean time, all Italy was thrown into the greateſt confuſion by the death of Charles the Bald, who died of poiſon at Pavia, as he was coming to the pope's aſſiſtance. Sergius duke of Naples continued a firm friend to the infidels; nor could he be detached from their intereſts even by the thunder of a papal excommunication; but unluckily happening to fall into the hands of his brother, Athanaſius biſhop of Naples the zeal of that prelate prompted him to put out his eyes and ſend him a cloſe priſoner to Rome; for which the higheſt encomiums were beſtowed on him by the holy father.

In the 876, Adelgiſe was murdered by two of his nephews; one of whom, by name *Gaideris*, ſeized the principality. About the ſame time Landulph biſhop of Capua dying, a civil war enſued among his children, though their father's dominions had been divided among them according to his will. The princes of Salerno and Benevento, the duke of Spoleto, and Gregory the Greek governor of Bari and Otranto, took different ſides in the quarrel, as they thought moſt proper: and to complete the confuſion, the new biſhop was expelled, and his brother, though a layman, choſen to that office, and even conſecrated by the pope who wrote to Gauferius, forbidding him to attack Capua under pain of excommunication. But though Gauferius was, in general, obedient to the pope's commands, he proved refractory in this particular, and laid ſiege to Capua, for two years ſucceſſively.

Thus the Capuan territories were reduced to the moſt miſerable ſituation; being obliged to maintain at the ſame time the armies of the prince of Benevento and the duke of Spoleto. The Saracens, in the mean time, took the opportunity of ſtrengthening themſelves in Italy: and Athanaſius, notwithſtanding the great commendations he had received from the pope for putting out his brother's eyes, conſented to enter into an alliance with them, in conjunction with whom he ravaged the territories of the pope as well as thoſe of Benevento and Spoleto, plundering all the churches, monaſteries, towns, and villages, through which they paſſed. At the ſame time the prince of Salerno was obliged to grant them a ſettlement in the neighbourhood of his capital; the duke of Geeta invited them to his aſſiſtance, being oppreſſed by the count of Capua and even the pope himſelf was obliged to make peace with them, and to grant them a ſettlement on the north ſide of the Carigliano, where they fortified themſelves, and continued for more than 40 years.

To put a ſtop to the confuſion which reigned in Italy, the pope now thought proper to reſtore the biſhop of Capua, who had been expelled, but allowed his brother to reſide in the city, and govern one half of the dioceſe; but notwithſtanding this partition, the civil diſſenſions continued with the utmoſt violence, the neareſt relations murdering or baniſhing each other according as the fortune of the one or the other prevailed.—Athanaſius, notwithſtanding all the pope's remonſtrances, continued his alliance with the Saracens; in conjunction with whom he ravaged the territory of Benevento, and fomented the diviſions in Capua, in hopes of being able to make a conqueſt of it. At laſt his holineſs thought proper to iſſue a ſentence of excommunication againſt him, but this attached him to the Saracens more than ever; inſomuch that he ſent to Suchaim, king of the Saracens in Sicily, deſiring him to come over and command a great body of his countrymen who had ſettled at the foot of Mount Veſuvius. Suchaim accepted the invitation, and immediately turned his arms againſt Athanaſius; allowing his troops to live at diſcretion in the territory of Naples where they raviſhed the women and plundered the inhabitants. Theſe calamities were, by the ſuperſtitious Neapolitans, imagined to be a conſequence of the ſentence of excommunication; and therefore they uſed their utmoſt endeavours to perſuade the prelate to conclude a league with ſome Chriſtian prince and renounce all connection with the infidels. In this they at laſt proved ſucceſsful, and Athanaſius concluded an alliance with Guaimarius prince of Salerno;

no; in conſequence of which the Saracens were obliged to quit the Neapolitan territories, and retire to Agrapoli. Athanaſius then directed his force againſt Capua, of which he made himſelf maſter in the year 882. The Saracens, however, ſtill continued their incurſions, and ravaged ſeveral provinces in ſuch a manner, that they became entirely deſolate.

16
The Saracens almoſt entirely cut off.

Theſe confuſions continued for a long time; during which the Greeks found an opportunity of making themſelves maſters of Benevento, and had well nigh become maſters alſo of Salerno; but in this they failed through the treachery of the biſhop, and in the year 896 they were totally expelled by the biſhop, four years after that they had become maſters of it. In 915 the Saracens received ſuch an overthrow at Garigliano, that ſcarce one of them remained. However, a new body ſoon arrived from Africa, and infeſted the ſea-coaſts for ſome time longer. A war alſo enſued between Landulph and the Greeks; which concluded diſadvantageouſly for the former, who was obliged to ſubmit to the emperor of Conſtantinople in 943.

In 961, Otho the Great, king of Germany, invaded Italy with a powerful army againſt Berengarius III. and, marching to Rome, received the imperial crown from the hands of the Pope. In 964, he erected Capua into a principality, received homage from the other princes of Lombardy, and formed a deſign of recovering Puglia and Calabria from the Greeks. But in this laſt ſcheme he failed; and after various hoſtilities a treaty was coucluded, and the young princeſs Theophania married to Otho's ſon, afterwards emperor.

17
The Normans firſt known in Italy.

All this time the Saracens continued their incurſions; and the Greeks had gained ground ſo much, that they were now in poſſeſſion of two thirds of the preſent kingdom of Naples; but in the year 1002 or 1003, the Normans firſt began to be remarkable in Italy. They had, about a century before, embraced Chriſtianity, and become very zealous in all the ſuperſtitions which were then practiſed. They were particularly zealous in viſiting ſacred places, eſpecially Rome, and the holy ſepulchre at Jeruſalem; and being naturally of a very martial diſpoſition, they forced through great bodies of Greeks and Saracens who oppoſed their paſſage. About this time 40, or, as others write, 100, of theſe Normans, returning from Jeruſalem by ſea, landed at Salerno in the habit of Pilgrims where they were honourably received by Guaimarius. During their reſidence at Salerno, a great body of Saracens landed, and inveſted the city. Guaimarius, not being in a condition to oppoſe the invaders by force was preparing to pay them a large ſum of money, which they demanded, when the Normans propoſed to attack them; and, having got arms and horſes from the prince, they engaged the infidels with ſuch fury aud bravery, that they entirely defeated them, and obliged them to fly to their ſhips. By this complete victory Guaimarius was filled with ſuch admiration of the valour of theſe ſtrangers, that he entreated them to remain in his country; offering them lands and the moſt honourable employments: but not being able to prevail with them to ſtay in Italy, or even accept of his preſents; at their departure he ſent ſome ambaſſadors with them to Normandy, in veſſels loaded with exquiſite fruits, rich furniture for horſes, &c. in order to allure the valiant Normans to leave their own country. This kind invitation encouraged a Norman chief, named *Oſmond Drengot*, to ſettle in Italy about the year 1015; having killed another lord in a duel, which obliged him to leave his own country, in order to avoid the reſentment of his ſovereign, Robert duke of Normandy. In the mean time, the city of Bari had revolted from the Greeks, and choſen one Mello for their leader, whoſe wife and children happened ſoon after to fall into the hands of their enemies, and were ſent priſoners to Conſtantinople. No ſooner, therefore did Mello hear of the arrival of theſe adventurers, than he engaged them to aſſiſt him; and having drawn together a conſiderable army, defeated the Greeks with great ſlaughter, and obliged them to abandon their camp. In this engagement the Normans diſtinguiſhed themſelves by their bravery: and the news of their ſucceſs ſoon brought from Normandy an innumerable multitude of their countrymen with their wives and children. By this reinforcement, Mello gained two other victories, took a great many towns; and obliged the Greeks to abandon a large territory; but, in 1019, they were utterly defeated, and every thing recovered by the Greeks. The Greek general, Bajanus, continued to go on with ſuch ſurpriſing ſucceſs, that he almoſt entirely re-eſtabliſhed the affairs of his countrymen in Italy, and made a diſtinct province of the weſtern part of Puglia, which he called *Capatanata*, and which to this day retains the name of *Capitanata*. His great progreſs at laſt alarmed the emperors of Germany; and, in 1027, Pandulphus prince of Capua made himſelf maſter of Naples; but was obliged three years afterwards, to leave it, by the Normans, who built the city of Averſa, which was now erected into a county. In conſequence of this piece of good fortune, great numbers of Norman adventurers migrated into Italy among whom were William, Drogo, and Umbert, three of the ſons of Tancred duke of Hautville, from whoſe poſterity thoſe princes were deſcended, who firſt conquered the iſland of Sicily from the Saracens, and formed the preſent kingdom of Naples.

18
They recover and defeat the Greeks.

19
But are at laſt defeated by them.

In 1040, the Greek emperor Michael Paleologus, in order to ſecure the affection of his fickle ſubjects, undertook the conqueſt of Italy from the Saracens, and for that purpoſe ſent a general named *Michael Maniacus* into Sicily. This commander, hearing of the great reputation of the Normans, ſent to Guaimarius, prince of Salerno, intreating him to grant him ſome of thoſe warriors. His requeſt was moſt willingly hearkened to by the prince of Salerno, who, to encourage the Normans to engage in the expedition promiſed them ſome additional rewards beſides the emperor's pay.

20
The Normans paſs over into Sicily.

William, Drogo, and Umbert, accordingly marched from Salerno with 300 of their countrymen; and paſſing over into Sicily, diſtinguiſhed themſelves moſt remarkably in the conqueſt of that iſland. Maniacus acknowledged, that the recovery of Meſſina was chiefly owing to their valour: and William with his Normans gained a complete victory over the Saracens before Syracuſe, where he killed the governor of the city in ſingle combat. Maniacus made himſelf maſter of Syracuſe, and almoſt entirely reduced the whole iſland; but being accuſed of treaſon, was next year carried priſoner to Conſtantinople. His ſucceſſor Doceanus, being a man of no abilities, quickly loſt the whole iſland except Meſſina, and treated his Norman auxiliaries with the utmoſt contempt. He would not allow them any ſhare of the booty; and even cauſed one Ardoin, a noble Lombard, and aſſociate and interpreter of the Normans, to be whipped round the camp, becauſe he refuſed to part with the horſe of a Saracen whom he had ſlain in ſingle combat. The conſequences of this tyrannical behaviour were very fatal to the Greeks. Ardoin ſoon after obtained leave to return to Italy under pretence of a vow, and all the Normans embarked at night along with him: but inſtead of going to Rome, Ardoin went immediately to Averſa, where he perſuaded count Rainulphus, ſovereign of that province, to join with him in the deſign he had formed of attacking the Greek provinces in Italy, which, he ſhowed him would be an eaſy conqueſt, as the inhabitants ſubmitted with great reluctance to the Greeks, and the provinces were at that time almoſt entirely defenceleſs. Rainulphus approved of the ſcheme, and raiſed 300 ſoldiers, whom he ſent under 12 officers, to join the other Normans under the ſons of Tancred; and made an agreement with Ardoin, that the conqueſts ſhould be equally divided among the chief leaders.

21 Their conqueſts.

Their firſt enterpriſe was the reduction of Melphis one of the ſtrongeſt cities in Puglia, which preſently ſurrendered; and they increaſed its fortifications ſo much, that it thenceforth became impregnable. Soon after this they made themſelves maſters of Venoſa, Aſcoli, and Lavello, with very little oppoſition. Doceanus, alarmed with the rapidity of their conqueſts, immediately left Sicily, and marched with his army into Puglia, where he attacked the invaders near the river Oliviento; but after a fierce engagement, he was obliged to retire with conſiderable loſs. The Greeks were ſoon after defeated a ſecond time at Cannæ; and in a third engagement, which happened near the river Ofanto, the army of Doceanus was entirely routed, and he himſelf obliged to fly to Bari. On this bad ſucceſs Doceanus was ordered to return to his command in Sicily, and another general was ſent with an army into Puglia. This new commander, however, had no better ſucceſs than his predeceſſor; for his army was entirely defeated in an engagement with the Normans, and he himſelf taken priſoner. Atenulphus, brother to one of the princes of Benevento, on whom the Normans had conferred the chief command, ſet at liberty the captive general without conſulting them, on receiving from him a conſiderable ſum of money. With this the Normans were ſo much diſpleaſed, that they deprived Atenulphus of his command, and beſtowed it on Argyrus, ſon to the late Mello, who had eſcaped from Conſtantinople, and now aſſumed the title of *duke and prince of Italy*. Before this time alſo Maniacus, whom we have formerly mentioned, had returned to Italy; and to ſtrike the greater terror into the revolted cities, had executed a number of people of all ages and ſexes with great inhumanity. Soon after this Maniacus openly rebelled againſt the Greek emperor Conſtantinus, and prevailed upon his own army to proclaim him emperor, beginning hoſtilities immediately againſt the Greek cities. Argyrus at the ſame time took Giovenazzo and beſieged Trani, and ſoon after beſieged Maniacus himſelf in Tarento; but he, being afraid of falling into the hands of the Normans, fled to Otranto, and from thence to Bulgaria, where, being entirely defeated by one of the emperors generals, he was taken priſoner, and had his head ſtruck off.

The Normans having now conquered the greateſt part of Puglia, proceeded to make a diviſion of their conqueſt, in which, after each commander had got his proper ſhare, the city of Melſis was left common to all, and appropriated as a place for aſſembling to conſult about the moſt important affairs of the nation. Argyrus alone was neglected in this diviſion; but he, having gained the favour of the emperor by expelling the rebel Maniacus from Italy, was by him created duke of Bari, on purpoſe to check the power of the Normans, with the title of *prince and duke of Puglia*. The Normans, however, were too powerful to be much awed by Argyrus, and behaved with great inſolence to the neighbouring princes; but as they could not be expelled by force, and were confirmed in their conqueſts by Henry II. emperor of Germany in 1047, the Greek emperor attempted to get rid of them, by ſending Argyrus with large ſums of money to bribe them to enter into his ſervice againſt the Perſians. But they, perceiving the ſnare, replied, that they were reſolved not to leave Italy unleſs they were expelled by force; upon which Argyrus made uſe of the ſame money in bribing the Puglians to aſſaſſinate theſe invaders.

22 Great numbers of them maſſacred.

This brought on a maſſacre, in which greater numbers of Normans periſhed than had fallen in all the late wars. Argyrus attempted to take advantage of the confuſion produced by this maſſacre, but was detected; after which he had recourſe to Pope Leo, beſeeching him to deliver Italy from theſe cruel tyrants: but this ſcheme proved ſtill more unſucceſsful than the others had been; for the pope himſelf was defeated and taken priſoner; and, in conſequence of the reſpect ſhowed him by the Normans, granted them, as a fief of the holy ſee, all the conqueſts they had made or ſhould make in Calabria and Sicily.

23 They are confirmed by the pope in all their conqueſts.

Soon after this, the Norman power became extremely formidable; the famous Robert Guiſcard aſcended the throne in 1056. He made great progreſs in the conqueſt of Calabria, and reduced moſt of the cities which held for the Greeks in theſe parts. About the ſame time the counts of Capua were expelled from their territory; and the abbot Deſiderius mentions his having ſeen the children of Landulphus V. the laſt count, going about as vagabonds, and begging for their ſupport. The pope, alarmed by theſe conqueſts. excommunicated the Normans in wholeſale, pretending that they had ſeized ſome of the territories belonging to the church; but, by the pretended ſubmiſſion of Robert, he not only was perſuaded to take off the ſentence of excommunication, but to inveſt him with the provinces of Apulia, Calabria, and Sicily. After this, he continued the war againſt the Greeks with great ſucceſs.

24 Sicily conquered by Robert Guiſcard,

In 1071, in conjunction with his brother Roger, he conquered the iſland of Sicily, and gave the inveſtiture of the whole iſland to him with the title of *count*, reſerving to himſelf only the half of Palermo, Meſſina, and the valley of Demona. The like ſucceſs attended his arms againſt Salerno in 1074; but after this, having unadviſedly taken ſome places from the pope, he again fell under the ſentence of excommunication; yet he was reconciled to him in 1080, and received a ſecond time the inveſtiture of all his dominions. The next year he undertook an expedition againſt the Greeks; and though the emperor was aſſiſted by a Venetian fleet, Robert made himſelf maſter of the iſland of Corfu, reduced Durazzo, and great part of Romania; inſomuch that by the ſucceſs of his arms, and his near approach to Conſtantinople, he ſtruck an univerſal terror among the Greeks. But while Robert was thus extending his conqueſts, he was alarmed by the news of a formidable rebellion in Italy, and that the emperor Henry had taken the city of Rome, and cloſely ſhut up the pope in the caſtle of St Angelo. Robert therefore, leaving the command of the army to his ſon Boemund, returned to Italy, where he immediately diſperſed the rebels, and releaſed the pope, while his ſon gained a conſiderable victory over the Greeks. After this Robert made great preparations for another expedition into Greece, in order to ſecond his ſon Boemund. Alexius Comnenius, who was about this time declared emperor by the Greek army, being aſſiſted by the Venetian fleet, endeavoured to oppoſe his paſſage, but was entirely defeated, with the loſs of a great many galleys. But a final ſtop was now put to his enterpriſes by his death, which happened in the iſland of Corfu in 1085.

25
And by the emperor of Germany.

Though the power of the Normans was thus thoroughly eſtabliſhed in Italy and Sicily, and though the prince of Benevento was in 1130 inveſted by the the pope with the title of king of Sicily; yet by reaſon of the civil diſſenſions which took place among themſelves and the general confuſion which reigned in Italy in thoſe ages, they were obliged, notwithſtanding all their valour, to ſubmit to the emperor in 1195. By him the Sicilians were treated with ſo great cruelty, that the empreſs Conſtantia was induced to conſpire againſt him in 1197, took him priſoner, and releaſed him only on condition of his ſending off his army immediately for the Holy Land. This was complied with; but the emperor did not long ſurvive that reconciliation, being poiſoned, as was ſuppoſed, by order of the empreſs.

26
The French become maſters of Sicily and Naples.

In 1254 the pope claimed the kingdom as a fief devolved on the church in conſequence of a ſentence of depoſition pronounced againſt king Frederic at the council of Lyons: and, in 1263, the kingdom was, in conſequence of this right, conferred on Charles count of Anjou. After much contention and bloodſhed, the French thus became maſters of Sicily and Naples. Their government was inſupportably tyrannical; and at the ſame time the haughtineſs of their king ſo provoked the pope, that he reſolved to humble him.—Charles had reſolved on an expedition againſt Conſtantinople; and for this purpoſe had fitted out a fleet of 100 galleys, 30 large ſhips, 200 tranſports beſides many other ſmaller veſſels, on board of which he intended to embark 10,000 horſe, and a numerous army of foot. This formidable armament greatly alarmed the emperor Michael Paleologus: for which reaſon he entered into a negociation with John di Procida, a noble Salernitan, lord of the iſle of Procida in the bay of Naples, who had formed a ſcheme for a general revolt in the iſland of Sicily. John, though a nobleman, was alſo a phyſician, and had been counſellor to two former princes, and even to king Charles himſelf: but being ſtripped of his eſtate by the king under pretence of treaſon, and his wife being debauched by the French, he retired to Conſtantia queen of Arragon, where he was created a baron of the kingdom of Valencia, by her huſband king Peter, and Lord of Luxen, Bénizzano, and Palma. As he was greatly exaſperated againſt the French, he employed many ſpies both in Puglia and Sicily; and being informed that the Sicilians were totally diſaffected to the French, he came to the iſland in diſguiſe, and concerted a plan with the moſt powerful of the malcontents for a revolution in favour of Conſtantia, though ſhe derived the right only as being the daughter of a former uſurper named *Manfred*. Procida then ſet out for Conſtantinople, where in ſome private conferences with the emperor, he perſuaded him, that the moſt probable means of defeating Charles's ſcheme was by aſſiſting the Spaniards and Sicilian malcontents. Paleologus accordingly granted him a large ſum of money, and on his departure ſent one of his ſecretaries along with him, who, landing in Sicily, had a conference with the chief conſpirator. John, having received letters from them diſguiſed himſelf in the habit of a Franciſcan, and went to Suriano in the neighbourhood of Rome. As he well knew the enmity which ſubſiſted between the pope and king Charles, he diſcloſed his deſign to his holineſs; who readily entered into his meaſures, wrote to Peter to haſten his armament, promiſing him the inveſtiture of the iſland as ſoon as he had taken poſſeſſion of it; and by refuſing the aſſiſtance he had promiſed to Charles, obliged him for the preſent to delay his expedition. In the beginning of the year 1280, Procida returned to Arragon, and by ſhowing the letters from the pope and Sicilian barons, prevailed on Peter to embark in his deſign, by aſſuring him of the aſſiſtance of Paleologus. The king of Arragon accordingly prepared a formidable fleet under pretence of invading Africa, and is even ſaid to have received 20,000 ducats from Charles, in order to aſſiſt him in his preparations.

But while John went on thus ſucceſsfully with his ſcheme, all his meaſures were in danger of being broke by the death of pope Nicholas. The new pope, Martin IV. was entirely in the intereſt of Charles, on whom, in 1281, he conferred the ſenatorial dignity of Rome. Procida, however, ſtill reſolved to proſecute his ſcheme; and leaving Italy, had another conference with the conſpirators in Sicily: after which, he again went to Conſtantinople, and obtained from Paleologus 30,000 ounces of gold, with which he immediately returned to Arragon. The death of Nicholas had damped the ardour of Peter; but, being urged with great earneſtneſs by John, he again renewed his preparations; which alarmed the pope and the king of France. In conſequence of this they ſent a meſſage to him, deſiring to know againſt what Saracens he deſigned to employ his armament. In this particular Peter refuſed to ſatisfy them; upon which they earneſtly counſelled Charles to guard againſt an invaſion; but he neglected their advice, being wholly intent on his eaſtern expedition, and encouraged by a revolt which had happened in Greece; and to facilitate his expedition, he prevailed on the pope to excommunicate the Greeks, on pretence that they had broken ſome of the articles of union concluded at the council of Lyons a few years before. Peter in the mean time continued

27 They are maſſacred.

his preparations with great diligence, intending to put to ſea the following ſummer. Procida had returned to Palermo, to wait for a favourable opportunity of putting his deſign in execution, which was ſoon afforded him by the French. On Eaſter Monday, March 30th, 1282, the chief conſpirators had aſſembled at Palermo; and, after dinner, both the Palermitans and French went in a grand proceſſion to the church of Monreale, about three miles without the city. While they were ſporting in the fields, a bride happened to paſs by with her train, who being obſerved by one Drochettus, a Frenchman, he ran to her, and began to uſe her in a rude manner, under pretence of ſearching for concealed arms. A young Sicilian, exaſperated at this affront, ſtabbed him with his own ſword; and a tumult enſuing, 200 French were immediately murdered. The enraged populace then ran to the city crying, out, "Let the French die, Let the French die;" and, without diſtinction of age or ſex, ſlaughtered all of that nation they could find, even ſuch as had fled to the churches. The conſpirators then left Palermo, and excited the inhabitants to murder the French all over the iſland, excepting in Meſſina, which city at firſt refuſed to be concerned in the revolt. But, being invited by the Palermitans to throw off the French yoke, a few weeks after, the citizens in a tumultuous manner deſtroyed ſome of the French; and pulling down the arms of king Charles, and erecting thoſe of the city, choſe one Baldwin for their governor, who ſaved the remaining French from the fury of the populace, and allowed them to tranſport themſelves, with their wives and children, to Italy. Eight thouſand perſons are ſaid to have been murdered on this occaſion.

Immediately after this maſſacre, the Sicilians offered their allegiance to the king of Arragon; who accepted of the invitation, and landed with his forces at Trapani. From thence he went to Palermo, where he was crowned king of Sicily with great ſolemnity, and Charles left the iſland with precipitation. The day after he landed his army in Italy, the Arragonian fleet arrived, took 29 of his galleys, and the next day burnt 80 tranſports in preſence of his army. Soon after this Charles ſent an embaſſy to Peter, accuſing him of perfidy, in invading his dominions in time of peace; and, according to ſome, challenged him at the ſame time to decide the matter by ſingle combat. Others ſay, that the challenge was given by Peter. Certain it is, however, that a challenge was given, and to appearance accepted: but Peter determined to employ much more effectual means in ſupport of his pretenſions than truſting to a duel; and therefore puſhed on his operations moſt vigorouſly, while his adverſary trifled away his time: and thus he at laſt became maſter of the conteſted kingdom; which, however, he did not long enjoy, dying about the end of the year 1285.

By his will, Peter left the kingdom of Arragon to his eldeſt ſon Alphonſus, and Sicily to Don James his other ſon, who was alſo to ſucceed to the kingdom of Arragon in caſe Alphonſus ſhould die without male iſſue. Accordingly, Don James was ſolemnly crowned at Palermo the 2d of February 1286. In 1295, however, he deſerted them, and tamely reſigned up his right to Charles, ſon to him abovementioned, in a manner perhaps unparalleled. On his reſignation the Sicilians conferred the crown upon his brother Don Frederic: after which the war continued with great violence till the year 1303, when a peace was concluded, and the kingdoms of Naples and Sicily formally disjoined; Frederic being allowed to keep the latter, under the name of *Trinacria;* and Charles being confirmed in the poſſeſſion of the former which he quietly enjoyed till his death in 1309.

28 The kingdoms of Naples and Sicily disjoined.

Naples continued to be governed by its own kings till the beginning of the 16th century, when the kings of France and Spain contended for the ſovereignty of this country. Frederic, at that time king of Naples, reſigned the ſovereignty to Lous XII. on being created duke of Anjou, and receiving an annual penſion of 30,000 ducats. But, in 1504, the French were entirely defeated by the Spaniards, and obliged to evacuate the kingdom; and the following year Louis renounced all pretentions to the crown, which from that time hath remained almoſt conſtantly in the hands of the Spaniards.

29 The Spaniards become maſters of Naples.

The government of the Spaniards proved no leſs oppreſive to the Neapolitans than that of others had been. The kings of Spain ſet no bounds to their exactions, and of conſequence the people were loaded with all manner of taxes; even the moſt indiſpenſable neceſſaries of life not being exempted. In 1647, a new tax was laid on fruit; which the people looked upon as the moſt grievous oppreſſion, the chief part of their ſubſiſtence, during the ſummer months, being fruit, which in the kingdom of Naples is very plentiful and delicious. The edict for collecting the new duty was no ſooner publiſhed, than the people began to murmur in a tumultuous manner; and when the viceroy came abroad, they ſurrounded his coach, bawling out to have their grievances redreſſed. They were encouraged in their ſedition, by the news that the citizens of Palermo had actually revolted on account of the impoſition of new duties. The viceroy, therefore, apprehenſive of greater diſorders, began to think of taking off the tax; but thoſe who farmed the tax having bribed ſome of his favourites, he was by their means perſuaded not to aboliſh it. The indignation of the people, who had ſuſpected his intention, was now greatly increaſed, eſpecially as they were privately excited by ſeveral malecontents. The farmers of the revenue, and all thoſe concerned in raiſing the taxes, had incurred the hatred and deteſtation of the people, particularly of Tommaſo Aniello, commonly called *Maſſaniello of Amalfi*, a fiſherman, whoſe wife, having been diſcovered in ſmuggling a ſmall quantity of meal, was impriſoned, and condemned to pay a fine of 100 ducats.

30 A general revolt.

31 Account of Maſſaniello.

Maſſaniello, a few years before, had come to Naples from Amalfi, where his father had been a fiſherman. At this time he was about 24 years of age, and the father of four children. He was of a middling ſtature, and an agreeable aſpect; was diſtinguiſhed for his boldneſs, activity, and integrity: and had a great influence with his companions, by whom he was beloved and eſteemed. As he was obliged even to ſell his furniture to pay the heavy fine, he had conceived an implacable hatred againſt the farmers of the taxes, and was alſo moved with compaſſion for the miſerable ſtate of the city and kingdom. He therefore formed a deſign, with ſome of his companions, to raiſe a tumult in the market-place on the feſtival-day of the Carmelites, uſually celebrated about the middle of July, when between 500 and 600 youths entertain the people by a mock- fight; one half of them in the character of Turks, defending a wooden caſtle, which is attacked and ſtormed by the other half in the character of Chriſtians. Maſſaniello being appointed captain of one of theſe parties, and one Pione, who was privy to his deſign, commanding the other, for ſeveral weeks before the feſtival they were very diligent in reviewing and training their followers, who were armed with ſticks and reeds: but a ſmall and unforeſeen accident tempted them to begin their enterpriſe without waiting for the feſtival.

On the 7th of July a diſpute happening in the market-place betwixt the tax-gatherers and ſome gardeners of Pozzuolo who had brought ſome figs into the city, whether the buyer or ſeller ſhould pay the duty; after the tumult had continued ſeveral hours, Maſſaniello, who was preſent with his company, excited the mob to pillage the office built in the market for receiving the duty, and to drive away the officers with ſtones. The elect of the people, who by deciding againſt the gardeners, had increaſed the tumult ran to the palace and informed the viceroy, who moſt imprudently neglected all means of putting a ſtop to the commotion. Maſſaniello, in the mean time, being joined by great numbers of people, ordered his young troop to ſet fire to all the offices for the taxes through the city; which command being executed with diſpatch, he then conducted them directly to the palace, where the viceroy, inſtead of ordering his Spaniſh and German guards to diſperſe them, encouraged their inſolence by timidly granting their demands. As they ruſhed into the palace in a furious manner, he eſcaped by a private door, and endeavoured to ſave himſelf in *Caſtel del Ovo;* but being overtaken by the rioters in the ſtreets, he was trampled upon by them, and pulled by the hair and whiſkers. However, by throwing ſome handfulſs of gold among them, he again eſcaped, and took ſanctuary in a convent of Minims, where, being joined by the archbiſhop of Naples, cardinal Filomarini, and ſeveral nobles by their advice he ſigned a billet, by which he aboliſhed all taxes upon proviſions. As a means to quell the tumult, he likewiſe deſired the cardinal to offer Maſſaniello a penſion of 2400 crowns, who generouſly rejected the bribe, and declared, that if the viceroy would keep his word, he would find them obedient ſubjects.

It was now expected that the tumult would ceaſe; but Maſſaniello, upon his return to the market-place, being joined by ſeveral malcontents, among whom were Genuino and one Peronne, who had formerly been a captain of the Sibirri, he was adviſed by them to order the houſes of thoſe concerned in raiſing the tax to be burned; which were accordingly in a few days reduced to aſhes, with all their rich furniture. Maſſaniello being now abſolute maſter of the whole city, and being joined by great numbers of people of deſperate fortunes, he required the viceroy who had retired to the *Caſtel Nuovo*, to aboliſh all the taxes, and to deliver up the writ of exemption granted by Charles V, This new demand greatly embarraſſed the viceroy; but to appeaſe the people, he drew up a falſe deed in letters of gold, and ſent it to them by their favourite the duke of Matalone, who had before been in confinement. The fraud, however, being diſcovered, the duke was pulled from his horſe and maltreated by the mob, and at length committed as a priſoner to Peronne. This accident, to the great joy of the viceroy, enraged the people againſt the nobility, ſeveral of whom they killed, burnt the houſes of others, and threatened to extirpate them all. Maſſaniello, in the mean time tattered and half naked, commanded his followers, who were now well armed, and reckoned about 100,000 men, with a moſt abſolute ſway. He eat and ſlept little, gave his orders with great preciſion and judgement, appeared full of moderation, without ambition and intereſted views. But the duke of Matalone having procured his liberty by bribing Peronne, the viceroy imitated his example, and ſecretly corrupted Genuino to betray his chief. A conſpiracy was accordingly formed againſt Maſſaniello by Matàlone and Peronne; the duke, who was equally exaſperated againſt the viceroy, propoſing, that after his death his brother D. Joſeph ſhould head the rebels.

Maſſaniello in the mean time by means of the cardinal archbiſhop, was negociating a general peace and accommodation; but while both parties were aſſembling in the convent of the Carmelites, the banditti hired by Matalone made an unſucceſsful attempt upon Maſſaniello's life. His followers immediately killed 150 of them. Peronne and D. Joſeph being diſcovered to be concerned in the conſpiracy were likewiſe put to death, and the duke with great difficulty eſcaped. Maſſaniello by this conſpiracy was rendered more ſuſpicious and ſevere. He began to abuſe his power by putting ſeveral perſons to death upon ſlight pretences; and, to force the viceroy to an accomodation, he out off all communication with the caſtles, which were unprovided with proviſion and ammunition. —The viceroy likewiſe being afraid leſt the French ſhould take advantage of the commotion, earneſtly deſired to agree to a treaty: which was accordingly concluded on the fifth day of the inſurrection, by the mediation of the archbiſhop. By the treaty it was ſtipulated that all duties impoſed ſince the time of Charles V. ſhould be aboliſhed: that the writ of exemption granted by that emperor ſhould be delivered to the people; that for the future no new taxes ſhould be impoſed; that the vote of the elect of the people ſhould be equal to the votes of the nobility; that an act of oblivion ſhould be granted for all that was paſt; and that the people ſhould continue in arms under Maſſaniello till the ratification of the treaty by the king.

32
A treaty concluded between Maſſaniello and the viceroy.

By this treaty, no leſs than 10,000 perſons, who fattened upon the blood of the public, were ruined.—The people, when it was ſolemnly publiſhed, manifeſted an extreme joy, believing they had now recovered all their ancient rights and privileges. Maſſaniello, at the deſire of the viceroy, went to the palace to viſit him, accompanied by the archbiſhop, who was obliged to threaten him with excommunication, before he would conſent to lay aſide his rags and aſſume a magnificent dreſs. He was received by the duke with the greateſt demonſtrations of reſpect and friendſhip, while the ducheſs entertained his wife, and preſented her with a robe of cloth of ſilver, and ſome jewels.—The viceroy to preſerve ſome ſhadow of authority, appointed him captain-general; and at his departure made him a preſent of a golden chain of great value, which with great difficulty he was prevailed upon to

33
Maſſaniello appointed captain-general.

accept; but yielded at length to the intreaties of the cardinal. Next day in conſequence of the commiſſion granted him by the viceroy, he began to exerciſe all the functions of ſovereign authority: and having cauſed a ſcaffold to be erected in one of the ſtreets, and ſeveral gibbets, he judged all crimes, whether civil or military, in the laſt reſort: and ordered the guilty to be immediately put to death, which was the puniſhment he aſſigned to all offences. Though he neglected all forms of law, and even frequently judged by phyſiognomy, yet he is ſaid not to have overlooked any criminal or puniſhed any innocent perſon.

34
Is aſſaſſinated.

His grandeur and proſperity was of very ſhort continuance; for his mind becoming diſtracted and delirious for two or three days, he committed a great many mad and extravagant actions; and on the 18th of July was aſſaſſinated with the conſent of the viceroy.

The tumult did not end with the death of Maſſaniello: on the contrary, the people now expelled the Spaniards from moſt of the cities throughout the kingdom; and this general inſurrection being the ſubject of diſcourſe at Rome, the duke of Guiſe, who happened then to be at the pope's court, took the opportunity, at the inſtigation of his holineſs, to offer his ſervice to the Neapolitans againſt the Spaniards. The duke was prompted by his ambition to engage in this enterpriſe, eſpecially as he himſelf had ſome diſtant pretenſions to the crown. The Spaniards in the mean time made a vigorous attack on the city; but were repulſed by the people, who now formally renounced their allegiance to them. In a ſhort time, however their city being ſurpriſed by the new viceroy, the count d'Oniate, and the duke of Guiſe himſelf taken priſoner, the people returned to their allegiance, and thus all the attempts of the French on Naples were fruſtrated. Since that time the Spaniards continued in peaceable poſſeſſion of the kingdom till the year 1707, when it was was taken from them by prince Eugene. It was formally ceded to the emperor by the treaty of Raſtadt in 1713; but was recovered by the Spaniards in 1734, and the king of Spain's eldeſt ſon is now king of Naples and Sicily. for a particular account of theſe revolutions, ſee the articles SPAIN and SICILY.

35
The people return to their allegiance.

36
Climate, produce, &c of Naples.

The climate of Naples is extremely hot, eſpecially in July, Auguſt, and September. In winter there is ſeldom any ice or ſnow, except on the mountains.—On account of its fertility it is juſtly termed an earthly paradiſe; for it abounds with all ſorts of grain, the fineſt fruit and garden productions of every kind, with rice, flax, oil, and wine, in the greateſt plenty and perfection. It affords alſo ſaffron, manna, alum, vitriol, ſulphur, rock-cryſtal, marble and ſeveral ſorts of minerals, together with fine wool, and ſilk. The horſes of this country are famous, and the flocks and herds very numerous. Beſides theſe products, of which a conſiderable part is exported, there are manufactures of ſtuff, ſoap and glaſs wares. Waiſtcoats, caps, ſtockings, and gloves, are alſo made of the hair or filaments of a ſhell fiſh, which are warmer than thoſe of wool, and of a beautiful gloſſy green. In this kingdom likewiſe is found that called the *Phrygian ſtone*, or *pietra, fungifera*, which, being laid in a damp ſhady place, will yield muſhrooms, ſometimes of a very large ſize, eſpecially if the ſtone is ſprinkled with hot water. See AGARICUS.

As to the mountains of this country, the principal are thoſe of the Appennine, which traverſe it from South to North; and Mount Veſuvius, which, as is well known, is a noted Volcano, five Italian miles from Naples. The ſide of the mountain next the ſea yields wine, particularly the two famed wines called *Vino Greco* and *Lachrymæ Chriſti*. One of the greateſt inconveniences to which this kingdom is expoſed is earthquakes, which the eruptions of Mount Veſuvius contribute in ſome meaſure, to prevent. Another inconveniency, which however is common to it with other hot countries, is the great number of reptiles and other inſects, of which ſome are very poiſonous.

37
Religion.

With reſpect to religion, it is on a very bad footing here. The number of convents and monaſteries is aſtoniſhing. It is ſaid the clergy and convents poſſeſs two thirds of the whole kingdom; nay, ſome maintain, that were the kingdom divided into five parts, four would be found in the hands of the church. Notwithſtanding this power and influence of the clergy, they have not been able hitherto to get the inquiſition eſtabliſhed here. In the year 1731, meaſures were taken for leſſening the number of convents; and lately the order of Jeſuits hath been ſuppreſſed. The papal bulls cannot be made public without the king's permiſſion; nor are proteſtants compelled to kneel in the churches, or at meeting the hoſt; and in Lent they can very eaſily procure fleſh meat. In the year 1740 the Jews were allowed to ſettle in the kingdom during the term of 50 years, and ſeveral privileges were granted them during that period; at the expiration of which the grant was ſuppoſed to be renewed unleſs they were expreſsly ordered to quit the country.

38
Revenue, &c.

The revenue of the kingdom, is generally computed at 3,000,000 of crowns: but, as Mr Addiſon obſerves, there is no country in Europe which pays greater taxes, and where, at the ſame time, the public is leſs the better for them, moſt of them going to the enriching of the private perſons to whom they are mortgaged.

The military force of this kingdom is ſaid to conſiſt of about 30,000 men of which the Swiſs regiments are the beſt. As to the marine, it conſiſts only of a few galleys. The only order here is that of St Januarius, which was inſtituted by Don Carlos in the year 1738.

The king of Naples, or of the two Sicilies, is an hereditary monarch. The high colleges are the council of ſtate, the privy-council, the treaſury, the Sicily-council, the council, of war, &c. This kingdom is a papel fief; and the king in acknowledgment of the pope's feudal right, ſends him every year a white palfry, and a purſe of 6000 ducats. The title of the king's eldeſt ſon is *prince of Calabria*. The number both of the high and low nobility in the kingdom of Naples is very great. "I am aſſured (ſays Dr Moore §) that the king of Naples counts among his ſubjects 100 perſons with the title of prinee, and a ſtill greater with that of duke. Six or ſeven of theſe have eſtates which produce from 10 to 12 or 13,000 l. a year; a conſiderable number have fortunes of about half the value; and the annual revenue of many is not above 1000 l. or 2000 l. The inferior orders of the nobility are much poorer. Many counts and marquiſſes have not above 300 l. or 400 l. a year of paternal eſtate; many have ſtill leſs; and not a few enjoy the title without any eſtate whatever. Theſe nobles, however, are

exceſſively

§ View of Society, &c in Italy.

Naples.

exceſſively fond of ſplendor and ſhow, which appears in the brilliancy of their equipages, the number of their attendants, the richneſs of their dreſs, and the grandeur of their titles. The fineſt carriages are painted, gilt, varniſhed, and lined, in a richer and more beautiful manner than has yet become faſhionable either in England or in France. They are often drawn by ſix and ſometimes by eight horſes. Before the carriage, it is the mode to have two running footmen, and behind three or four ſervants in the richeſt liveries. The ladies and gentlemen within the coaches glitter in all the brilliancy of lace, embroidery, and jewels.— This finery is not confined to the perſons within and without the coaches; it is extended to the horſes, whoſe heads, manes, and tails, are ornamented with the rareſt plumage, and ſet off with ribbons and artificial flowers."

We ſhall mention a circumſtance from which an idea may be formed of the grandeur of a Neapolitan palace, and the number of domeſtics which ſome of the nobility retain. "I dined (continues our author) at the prince Iacci's, where we paſſed through 12 or 13 large rooms before we arrived at the dining-room. There were 36 perſons at table ſerved by the prince's domeſtics, and each gueſt had a footman behind his chair, while other domeſtics belonging to the prince remained in the adjacent rooms and in the hall. No eſtate in England could ſupport ſuch a number of ſervants, paid and fed as Engliſh ſervants are; but in Naples the wages are very moderate indeed, and the greater number of men-ſervants, belonging to the firſt families, give their attendance through the day only, and find beds and proviſions for themſelves. It muſt be remembered alſo, that few of the nobles give any entertainments; and thoſe who do not are ſaid to live very ſparingly; ſo that the whole of their revenue, whatever it may be, is expended on articles of ſhow."

In the kingdom of Naples, the hereditary juriſdiction of the nobles over their vaſſals ſubſiſts in the full rigour of the feudal government. The peaſants therefore are poor; and it depends entirely on the perſonal character of the maſter, whether their property be not the leaſt of their grievances. As this power is too often abuſed, the importance of the nobility depends in a great meaſure on the favour of the king, who, under pretence of any offence, can confine them to their eſtates, or impriſon them at pleaſure. Unleſs this prince were ſo very impolitic as to diſguſt all the nobility at once, and ſo unite the whole body againſt him, he has little to fear from their reſentment. Even in caſe of ſuch an union, as the nobles have loſt the affection of their vaſſals, what could they do in oppoſition to a ſtanding army of 30,000 men, entirely devoted to the crown? The government of Naples, therefore, is in fact a deſpotic monarchy, though ſomething like the form of a feudal conſtitution in its ancient purity is ſtill kept up by the biennial ſummons of the general aſſembly. This convention, which conſiſts of the nobility and commons, is called together every two years, to deliberate on the cuſtomary free-gift to the crown.

The inhabitants of this country have at all times borne but an indifferent character among other nations. "From the few hints dropped by the claſſic authors, we collect that the ancient Neapolitans were a race of Epicureans, of a ſoft indolent turn, averſe from martial exerciſes, paſſionately fond of theatrical amuſements and muſic, expert in all the refined arts that adminiſter to the caprices of luxury, extravagant in their expreſſions and geſtures, and expoſed to various ſorts of ſuperſtition. If we make allowance for a quantity of northern blood which has mingled with the original Grecian ſtream, and imparted a rougher caſt, not yet worn off by the mildneſs of the climate, we ſhall find the modern Neapolitans very like the ancient.— Proviſions being here plentiful and cheap, the lower claſs of people work but little. Their delight is to baſk in the ſun, and do nothing. Perſons of a middle rank frequent places of public reſort; and very few of any rank attend to their proper buſineſs with the zeal and activity we are wont to meet with in the profeſſional men of colder countries. Gluttony is a predominant vice, while inſtances of ebriety are comparatively rare. In the female ſex, the paſſion for finery is almoſt ſuperior to every other; and, though chaſtity is not the characteriſtic virtue of the country, Mr Swinburne doubts § whether a Neapolitan woman would not nine times out of ten prefer a present to a lover. That furious jealouſy for which the nation was once ſo remarkable, is now greatly abated. The breach of the conjugal vow ſometimes occaſions quarrels and aſſaſſinations among people of an inferior ſtation; and in the metropolis, aſſaſſinations are often perpetrated from much leſs cogent motives. Of theſe vices, many are doubtleſs owing to that ſlavery and oppreſſion under which they groan, and to a radical defect in the adminiſtration of juſtice, though the kingdom is divided into 12 provinces or juriſdictions.

§ Trav. in the Two Sicilies.

Naples.

Naples, anciently *Parthenope*, afterwards *Neapolis*, the capital of the kingdom of that name in Italy, lies in the province called *Terra di Lavora*, which is the richeſt and beſt inhabited of the whole kingdom, and comprehends a part of the ancient Campania Felix, or the Happy. This city is fabled to owe its foundation to a ſyren, and to have received its ancient name from its ſupernatural foundreſs. Whatever be its origin, it is the firſt for neatneſs, and the ſecond for extent, of all the cities in Italy. It was formerly a place of ſtrength; but its walls at preſent being of no real defence, its ſafety depends of courſe upon the force of its armies. It is moſt advantageouſly ſituated, having a delicious country on one ſide, and a noble bay of the Mediterranean on the other, with an excellent harbour. The circumference, including the ſuburbs, is ſaid not to be leſs than 18 Italian miles, and the number of the inhabitants therein little leſs than 400,000. The houſes are of ſtone, flat-roofed, and generally lofty and uniform; but many of them have balconies, with lattice-windows. The ſtreets are well paved; but they are not lighted at night, and in the day-time are diſfigured, in many places, by ſtalls on which proviſions are expoſed to ſale. Here are a great number of fine churches, convents, fountains, and palaces of the nobility, many of whom conſtantly reſide here. It is uſual to walk on the tops of the houſes in the evenings, to breathe the ſweet cool air, after a hot ſultry day. The climate here is ſo mild and warm, even in the winter, that plenty of green peaſe, artichokes, aſparagus, and other vegetables, may be had ſo early as the beginning of the new year, and even all the winter. This city ſwarms with monks and nuns of all ſorts, to ſuch a dgeree, that there are no leſs than 19 convents of the Dominicans alone, 18 of the Franciſcans, 8 of the Auguſtines, and an equal proportion of the reſt. The magnificence of many of the churches exceeds imagination. In a cloyſter of the Carthuſian monaſtery is a crucifix, ſaid to be done by Michael Angelo, of inimitable workmanſhip.

To repel hoſtile attempts by ſea, which, from its ſituation, maritime powers might be tempted to make, Naples has, to the weſt, the Caſtel del Uovo, a confuſed pile of ancient buildings, and ſome modern batteries. The rock upon which this fortreſs ſtands was originally called *Megara*, then *Lucullanum*, and was conſidered as a place of ſtrength ſo early as in the year 475. Along the line of the ſhore towards the eaſt are ſome batteries on the points of land, the baſtions of the arſenal, and above it the lofty wall of the Caſtel Nuovo. This laſt fortreſs has been the uſual refuge of the ſovereigns and viceroys in all civil wars and tumults; for which reaſon they have long fixed their reſidence near its walls. A block-houſe and batteries defend the mouth of the harbour, and at the eaſtern extremity of the town is the Torrione de Carmine, better known by the figure it made in Maſſaniello's rebellion than by its extent or military ſtrength. The caſtle of Saint Elmo commands Naples in every direction, and is in reality calculated rather to annoy and awe the citizens than to defend them from foreign invaders. The city is indeed far from being ſecure againſt a bombardment; for the ſea is ſo deep, that a large veſſel may come up to the very mole in defiance of the block-houſe and batteries, &c. Pictures, ſtatues, and antiquities, are not ſo common in Naples as might be expected in ſo great and ancient a city, many of the moſt valuable pieces having been ſpent to Spain by the viceroys. The bay is one of the fineſt in the world, being almoſt of a round figure, of about 30 miles in diameter, and three parts of it ſheltered with a noble circuit of woods and mountains. The city ſtands in the boſom of this bay, in as pleaſant a ſituation, perhaps, as in the world. Mr Keyſler ſays, they reckon about 18,000 *donne libere*, or courtezans in the city, and Dr Moore computes the number of *lazzarani* or blackguards at above 30,000. The greater part of theſe wretches have no dwelling-houſes, but ſleep every night under porticos, piazzas, or any kind of ſhelter they can find. Thoſe of them who have wives and children, live in the ſuburbs of Naples near Peuſilippo, in huts, or in caverns or chambers dug out of that mountain. They are generally repreſented as a lazy, licentious, and turbulent ſet of people, as indeed by far the greater part of the rabble are, who prefer begging or robbing, or running errands, to any fixed and permanent employment. Yet there are in Naples ſome flouriſhing manufactures, particularly of ſilk ſtockings, ſoap, ſnuff-boxes of tortoiſe ſhells and the lava of Mount Veſuvius, tables, and ornamental furniture of marble. The city is ſupplied with a vaſt quantity of water, by means of a very coſtly aqueduct, from the foot of Mount Veſuvius. Mr Addiſon ſays, it is incredible how great a multitude of retainers to the law there are in Naples, who find continual employment from the fiery temper of the inhabitants. There are five piazzas or ſquares in the city, appropriated to the nobility, viz. thoſe called *Capuna*, *Nido*, *Montagna*, *Porto*, and *Porta Nova*. Of all the palaces, that of the king is not only the moſt magnificent, but alſo in the beſt ſtyle of architecture. The cathedral, though Gothic, is a very grand ſplendid edifice. It is here that the head and blood of St Januarius, the tutelary ſaint of Naples, are kept, the latter in two glaſs or cryſtal vials. The pretended liquefaction of the dried blood, as ſoon as brought near the head of the ſaint, is a thing well known; Mr Addiſon ſays, it is one of the moſt bungling tricks he ever ſaw †. The harbour is ſpacious, and kept in good repair. It is fortified with a mole, which runs above a quarter of a mile into the ſea, and at the extremity has a high lantern to direct ſhips ſafely into the harbour. Luxury here is reſtrained by ſevere ſumptuary laws, and the women are more cloſely confined than in any other city of Italy. Here is an univerſity and two academies of wits, the one called *Gli Ardenti*, and the other *Gli Otioſi*. The nunnery for ladies of quality is ſaid to be the largeſt in the whole world, containing no leſs than 350 nuns, beſides ſervants. The Mount of Piety, or the office for advancing money to the poor, on pledges, at a low intereſt, or without any, has an income of upwards of 50,000 ducats. The arſenal is ſaid to contain arms for 50,000 men. The walls of the city conſiſt of hard black quarry ſtones, called *piperno*.—Inſtead of ice, vaſt quantities of ſnow are uſed for cooling their liquors, not ſo much as water being drank without it; ſo that, it is ſaid, a ſcarcity of it would as ſoon occaſion a mutiny as a dearth of corn or proviſions. Certain perſons, who farm the monopoly of it from the government, ſupply the city all the year round from a mountain about 18 miles off, at ſo much the pound. Naples ſtands 110 miles ſouth-eaſt from Rome, 164 north-eaſt from Palermo in Sicily, 217 ſouth-eaſt from Florence, and 300 from Venice. E. Long. 14. 20. N. Lat. 40. 55.

NARBO (anc. geog.), a town of the Volcæ Tectoſages, called alſo *Narbo Martius*, from the Legio Martia, the colony led thither 59 years before the conſulate of Cæſar, (Velleius); increaſed with a colony of the Decumani or tenth legion by Cæſar. An ancient trading town on the Atax, which diſcharges itſelf into the ſea through the Lacus Rubreſus, or Rubrenſis. Capital of the Gallia Narbonenſis; ſurnamed *Colonia Julia Paterna*, from Julius Cæſar, the father of Auguſtus by adoption. Now called *Narbonne*, a city of Languedoc.

NARBONNE, is a city of France in Lower Languedoc, with an archbiſhop's ſee, and is particularly famous for its honey. It is ſeated on a canal cut from the river Aude, which being but three miles from the ſea, veſſels come up it laden with merchandiſe, which renders it a place of ſome trade. But though it pretends to the moſt remote antiquity under the Celtic kings, in ages anterior even to the Roman conqueſts, which under theſe latter maſters gave its name to all the *Gallia Narbonenſis*, and was a colony of the firſt conſideration, it is now dwindled to a wretched ſolitary town, containing ſcarce 8000 inhabitants, of whom three fourths are prieſts and women. The ſtreets and buildings are mean and ruinous; it has indeed a communication with the Mediterranean, from which Narbonne is only about three leagues diſtant, by means of a ſmall river which interſects the place; but their commerce is very limited, and chiefly conſiſts in grain which they export to Cette and Marſeilles. No marks of Roman magnificence remain, except ſeveral inſcriptions in different parts of the city. It is divided into the city and the town, which are joined together by a bridge, with houſes on each ſide, in which the richeſt merchants live. There are ſeveral churches and convents, and the metropolitan church has a handſome ſteeple. E. Long. 2. 6. N. Lat. 43. 11.

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† See Chemiſtry, nº 803.

NARCISSUS, in fabulous hiſtory, the ſon of the river Cephiſſus and Liriope the daughter of Oceanus, was a youth of great beauty. Tireſias foretold that he ſhould live till he ſaw himſelf. He deſpiſed all the nymphs of the country; and made Echo languiſh till ſhe became a mere ſound, by refuſing to return her paſſion; but one day coming weary and fatigued from the chace, he ſtopped on the bank of a fountain to quench his thirſt; when, ſeeing his own form in the water, he became ſo in love with the ſhadowy image that he languiſhed till he died. On which the gods, being moved at his death, changed him into the flower which bears his name.

NARCISSUS, in botany: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 9th order, *Spathaceæ*. There are ſix petals; the nectarium is funnel-ſhaped, and monophyllous; the ſtamina are within the nectarium. The moſt remarkable ſpecies are.

1 The baſtard narciſſus, or common yellow Engliſh daffodil, grows wild in great plenty in many of the woods and coppices and under hedges in ſeveral parts of England. In the counties round London the herb folks bring prodigious quantities in the ſpring of the year, when in bloom, root and all, and ſell them about the ſtreets Its commonneſs renders it of but little eſteem with many; conſidered, however, as an early and elegant flower, of exceeding hardineſs and eaſy culture, it merits a place in every garden.

2. The bicolor, or two-coloured incomparable narciſſus, hath a large, oblong, bulbous root; crowned with long, narrow, dark-green leaves, 12 or 14 inches long; an upright flower-ſtalk, about 15 inches high, terminated by an uniflorous ſpatha, protruding one large flower with white petals, and a bell-ſhaped, ſpreading, golden nectarium, waved on the margin, and equal in length with the corolla; flowering in April. The varieties are, common ſingle-flowered—ſemi-double-flowered, with the interior petals ſome white and ſome yellow—with ſulphur-coloured flowers.

3. The poeticus, poetic daffodil, or common white narciſſus, is well known. Of this there are varieties with purple cupped flowers—yellow cupped flowers—double-flowered: all of them with entire white petals. It is the ancient celebrated narciſſus of the Greek and Roman poets, which they ſo greatly extol for its extreme beauty and fragrance.

The bulbocodium, hath a ſmall bulbous root, crowned with ſeveral narrow, ſubulate, ruſh like leaves, ſix or eight inches long: amidſt them a ſlender taper flower-ſtalk, ſix inches high, terminated by an uniflorous ſpatha, protruding one yellow flower, having the nectarium much larger than the petals, and very broad and ſpreading at the brim; flowering in April. From the large ſpreading nectarium of this ſpecies, which being three or four times longer than the petals, narrow at bottom, and widening gradually to the brim, ſo as to reſemble the ſhape of ſome old faſhioned hoop peticoats, it obtained the name *hoop-petticoat narciſſus*.

Narciſſus.

5. The ſerotinus, or late-flowering ſmall autumnal narciſſus, hath a ſmall bulbous root; crowned with a few narrow leaves; amidſt them a jointed flower-ſtalk eight or nine inches high, terminated by an uniflorous ſpatha, protruding one white flower, having a ſhort, ſix-parted, yellow nectarium; flowering in autumn.

6. The tazetta, or multiflorous daffodil, commonly called *polyanthus narciſſus*, hath a very large, roundiſh, bulbous root: long, narrow plain leaves; an upright flower-ſtalk, riſing from 10 or 12 inches to a foot and a half high; terminated by a multiflorous ſpatha, protruding in many large, ſpreading, white and yellow flowers, in a cluſter, having bell-ſhaped nectariums ſhorter than the corolla; flowering in February, March and April, and is very fragrant. The varieties of this are very numerous, conſiſting of about eight or nine principal ſorts, each of which having many intermediate varieties: amount in the whole greatly above an hundred in the Dutch floriſts catalogues, each variety diſtinguiſhed by a name according to the fancy of the firſt raiſer of it. They are all very pretty flowers, and make a charming appearance in the flower-borders, &c. they are alſo finely adapted for blowing in glaſſes of water, or in pots, to ornament rooms in winter.

7. The jonquilla, or jonquil, ſometimes called *ruſh, leaved daffodil*, hath an oblong, bulbous, brown root-ſending up ſeveral long, ſemi-taper, ruſh-like, bright-green leaves; amidſt them an upright green flower-ſtalk, a foot or 15 inches high; terminated by a multiflorous ſpatha, protruding many yellow flowers, often expanded like a radius, each having a hemiſpherical, crenated nectarium, ſhorter than the petals; flowering in April, and moſtly of a fine fragrance. The varieties are, jonquil minor with ſingle flowers—jonquil major with ſingle flowers—ſtarry flowered—yellow and white flowered—white flowered—ſemi-double-flowered—double-flowered—and large double inodorous jonquil: all of them multiflorous, the ſingle in particular; but ſometimes the doubles produce only two or three flowers from a ſpatha, and the ſingles commonly ſix or eight. All the ſorts have ſo fine a ſhape, ſo ſoft a colour, and ſo ſweet a ſcent, that they are ſome of the moſt agreeable ſpring-flowers.

8. The calathinus, or multiflorous yellow narciſſus, hath a large bulbous root; crowned with long, narrow, plane leaves; and amidſt them an erect, robuſt flower-ſtalk, terminated by a multiflorous ſpatha, protruding many large, entire, yellow flowers, having a bell-ſhaped, ſlightly crenated nectarium, equal in length with the petals.

9. The odorous, odoriferous, or ſweet-ſcented ſtarry yellow narciſſus, hath a bulbous root; narrow leaves; erect flower-ſtalk, a foot or more high, terminated by a ſub-multiflorous ſpatha, protruding ſometimes but

one, and ſometimes ſeveral entirely yellow flowers, having a campanulated, ſix-parted, ſmooth nectarium, half the length of the petals.

10. The triandrus, or triandrous ruſh-leaved white narciſſus, hath a bulbous root; very narrow, ruſh-like leaves, erect flower-ſtalk, terminated by an uniflorous ſpatha, protruding one ſnowy-white flower, having a bell ſhaped, crenated nectarium, half the length of the petals, and with moſtly triandrous or three ſtamina.

11. The trilobus, or trilobate yellow narciſſus, hath a bulbous root; narrow ruſh-like leaves; erect flower ſtalks, terminated by a ſub-multiflorous ſpatha, protruding ſometimes but one or two, and ſometimes ſeveral, yellow flowers, having a bell ſhaped, three-lobed nectarium, half the length of the petals.

12. The minor, or yellow winter daffodil, hath a ſmall bulbous root; plane leaves eight or ten inches long, and more than half a one broad; an erect flower-ſtalk, terminated by an uniflorous ſpatha protruding one nodding yellow flower, with ſpear ſhaped petals, having an obconic, ſix-parted, waved nectarium, equal to the length of the corolla; flowering in winter, or very early in ſpring.

All theſe 12 ſpecies of narciſſus are of the bulbous-rooted tribe, and univerſally perennial in root, but annual in leaf and flower-ſtalk; all of them riſing annually in ſpring, immediately from the crown of the bulb, firſt the leaves, and in the midſt of them the flower-ſtalk, one only from each root, entirely naked or leafleſs, each terminated by a ſpatha or ſheath, which opens on one ſide to protrude the flowers, and then withers; the flowers, as before obſerved are all hexapetalous, each furniſhed with a nectarium in the centre, and are univerſally hermaphrodite; they are large and conſpicuous, appearing moſtly in the ſpring-ſeaſon, generally from March or April until June, ſucceeded by ripe ſeed in July; then the leaves and flower-ſtalks decay, and the roots deſiſt from growing for ſome time; at which period of reſt is the only proper time to take up or tranſplant the roots from one place to another or to ſeparate the offsets; for they all multiply abundantly by offset young bulbs from the main root, inſomuch that a ſingle bulb will in one or two years be increaſed into a large cluſter of ſeveral bulbs, cloſely placed together, and which every ſecond or third year ſhould be taken up at the above period in order to be ſeparated; and each offset ſo ſeparated commences a diſtinct plant: which being planted again in autumn, produces flowers the following ſummer, alike in every reſpect to thoſe of their reſpective parent bulbs. All the ſpecies are ſo hardy that they proſper in any common ſoil of a garden: obſerving, however, to allow the finer ſorts of *polyanthus narciſſus*, in particular, principally a warm dry ſituation; all the others may be planted any where in the open dry borders and flower-beds.

NARCOTICS, in medicine, ſoporiferous drugs, which bring on a ſtupefaction. Among narcotics the moſt eminent are thoſe uſually prepared for medicinal uſes from the poppy, eſpecially opium; as alſo all thoſe prepared from mandragoras, hyoſcyamus, ſtramonium, and datura.

NARDO, a pretty populous town in the kingdom of Naples, and in the Terra d'Otranto, with the title of a duchy and a biſhop's ſee. E. Long. 18. 27. N. Lat. 43. 28.

In this little city are 8000 inhabitants. The ſteeple of its cathedral is built in a very uncommon but ſhowy ſtyle of Gothic architecture. Luca Giordano and Solimeni have adorned the church with ſome agreeable paintings. This place was part of the Balzo eſtate. The Aquavras were the next poſſeſſors: they are thought to have come from the Marca di Ancona. In 1401, in conſideration of their relationſhip to Pope Boniface IX. Laudiſlaus erected their manor of Ari into a dukedom, an honour till then ſeldom granted to any but princes of the blood royal. Claudius Aquaviva, a famous general of the Jeſuits, who died in 1615, was of this family.

NARDUS, in botany: A genus of the monogynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. There is no calyx; the corolla is bivalved.

This plant was highly valued by the ancients, both as an article of luxury and medicine. The *unguentum nardium* was uſed at baths and feaſts as a favourite perfume. Its value is evident from that paſſage of ſcripture, where our Saviour's head was anointed with a box of it, with which Judas found fault. From a paſſage in Horace it appears that this ointment was ſo valuable among the Romans, that as much as could be contained in a ſmall box of precious ſtone was conſidered as a ſort of equivalent for a large veſſel of wine, and a proper quota for a gueſt to contribute at an entertainment, according to the ancient cuſtom;

————*Nardo vina merebere.*
Nardi parvus onyx eliciet cadum.

The plant had a great character among the ancients as a medicine, both internally taken and externally applied. It has a place in the liſt of all antidotes from thoſe of Hippocrates (given on the authority of Myrepſus and Nicholaus Alexandrinus) to the officinals which have kept their ground till lately, under the names of *Mithridate* and *Venice treacle*. Galen and Alexander Trallian recommend it in the dropſy and gravel; Celſus and Galen in pains of the ſtomach and bowels, both internally given and externally applied. Galen preſcribed the oleum nardium to the emperor Marcus Aurelius when afflicted with a cholera morbus. It was externally applied to the ſtomach on wool; and the ſucceſs was ſo great, that he ever afterwards enjoyed the higheſt confidence of that emperor. In a work attributed to Galen, alſo, it is mentioned that a medicine compoſed of this and ſome other aromatics was found uſeful in long protracted fevers; and the natives of India at preſent conſider it as a very efficacious remedy in fevers. Its ſenſible qualities, indeed, promiſe it to be of conſiderable efficacy in ſome caſes, as it has a pungency of taſte ſuperior to contrayerva, and little inferior to ſerpentaria.

But though the name of this plant, with the uſes and virtues of it, has long been familiar in the writings of botaniſts and phyſicians, the genus and ſpecies of the plant have only been aſcertained very lately. In the Philoſophical Tranſactions for 1790, Dr Blane gives an account of it from a letter ſent him by his brother from Lucknow, dated in December 1786.—According to this gentleman's relation, being one day on a hunting party with the nabob viſier, after croſsing the river Rapty, about 20 miles from the foot of the northern mountains, he was ſurpriſed to find the air perfumed with an aromatic ſmell, which, as he was told, proceeded from the roots of the graſs that were bruiſed or torn out of the ground by the nabob's elephants and horſes. The country was wild, uncultivated, and entirely covered with this kind of graſs, which grew in large tufts cloſe to each other, and from three to four feet long. As none of it was in flower, it being then the winter ſeaſon, and the graſs having beſides been burnt down by order of the nabob, our author cauſed ſome of the roots to be dug up, in order to plant it in his garden at Lucknow.—Here it proſpered exceedingly; and ſhot up ſpikes to the height of ſix feet. A ſpecimen was ſent to Sir Joſeph Banks, who found it to belong to the genus of andropogon, different from any ſpecies hitherto deſcribed by botaniſts. "There is great reaſon, however (ſays Dr Blane), to think that it is the true nardus Indica of the ancients; for, 1. The circumſtance of its diſcovery correſponds in a ſtriking manner with an occurrence related by Arrian in his Hiſtory of Alexander's expedition into India. During the march of that hero through the deſarts of Gedroſia, the air was perfumed by the ſpikenard, which was trampled under foot by the army; and the Phœnicians, who accompanied them, collected great quantities of it, as well as of myrrh, to carry them into their own country to make merchandiſe of them. This laſt circumſtance ſeems further to aſcertain it to have been the true nardus; for the Phœnicians, who even in war appear to have retained their true genius for commerce, could no doubt diſtinguiſh the proper quality of thus commodity. I am informed by major Rennel, that Gedroſia anſwers to the modern Mackran, or Kedgemackran, a maritime province of Perſia, ſituated between Kermon (the antient Carmania), and the river Indus, being of courſe the frontier province of Perſia towards India; and that it appears from Arrian's account, and from a Turkiſh map of Perſia, that this deſart lies in the middle tract of country between the river Indus and the Perſian gulf, and within a few days march of the Arabian or Erythræan ſea. By this the ancients meant the northern part of the Ethiopic ocean, which waſhes the ſouthern coaſts of Arabia and Perſia; not what we now call the Red Sea, as its name would ſeem to imply, for this by the ancients was called the *Arabian Gulph*. 2. Though the accounts of the ancients concerning this plant are very defective, it is plain that it was of the natural order of grammina; for the term *ariſta*, ſo often applied to it, was appropriated by them to the fructification of grains and graſſes, and ſeems to be a word of Greek original, to denote the moſt excellent portion of thoſe plants, which are the moſt uſeful in the vegetable creation for the ſuſtenance of animal life; and nature has alſo kindly made them the moſt abundant in all parts of the habitable earth. Galen ſays, that though there are various ſorts of nardus, the term ναρδος ϛαχυς, or *ſpikenard*, ſhould not be applied to any but the nardus Indica. It would appear that the nardus Celtica was a plant of a quite different habit, and is ſuppoſed to have been a ſpecies of valeriana.

"The deſcription of the Nardus Indica by Pliny does not indeed correſpond with the appearance of our ſpecimen; for he ſays it is *frutex radice pingui et craſſa*, whereas ours has ſmall fibrous roots. But as Italy is very remote from the native country of this plant, it is reaſonable to ſuppoſe that others more eaſily procurable uſed to be ſubſtituted for it; and the ſame author ſays, that there were nine different plants by which it could be imitated and adulterated. There is a *Nardus Aſſyria* mentioned by Horace; and Dioſcorides mentions the *Nardus Syriaca* as a ſpecies different from the *Indica*, which certainly was brought from ſome of the remote parts of India; for both Dioſcorides and Galen, by way of fixing more particularly the country from whence it came, call it the *Nardus Gangites*. 3. *Garcias ab Horto*, a Portugueſe who reſided many years at Goa in the 16th century, has given a figure of the roots or rather of the lower parts of the ſtalks, which correſponds with our ſpecimen, and he ſays that there is but this one ſpecies of nardus known in India, either for the conſumption of the natives, or for exportation to Perſia and Arabia. 4. The ſenſible qualities of this are ſuperior to what commonly paſſes for it in the ſhops, being poſſeſſed both of more fragrancy and pungency, which ſeems to account for the preference given to it by the ancients.

"There is a queſtion, concerning which Matthiolus, the commentator of Dioſcorides, beſtows a good deal of argument, viz. whether the roots or ſtalks were the parts eſteemed for uſe, the teſtimony of the ancients themſelves on this head being ambiguous. The roots of this ſpecimen are very ſmall, and poſſeſs ſenſible qualities inferior to the reſt of the plant; yet it is mentioned in the account above recited, that the virtues reſide principally in the huſky roots. It is evident, that by the huſky roots muſt here be meant the lower part of the ſtalks and leaves, where they unite to the roots; and it is probably a ſlight ambiguity of this kind that has given occaſion to the ambiguity that occurs in the ancient accounts."

The ſenſible qualities of this plant do not depend upon an eſſential oil, but on ſome fixed principle like thoſe of cardamoms or ginger. Dr Blane tried to extract its virtues with boiling water, maceration in wine or proof ſpirits, but it yielded them ſparingly and with difficulty to any of theſe menſtrua. The Indians gave an infuſion of it in hot water, with a ſmall quantity of black pepper as a febrifuge.

NAREA, the moſt ſoutherly province of the empire of Abyſſinia; a kingdom ſtill governed by its own princes, who have the title of *Beneros*. Its territory was formerly more extenſive than at preſent, the Galla having almoſt quite ſurrounded it, eſpecially on the ſouth-eaſt and north. The country to the weſt is the moſt unknown part of Africa; the kingdom itſelf ſtands like a fortified place in the middle of a plain, being an high and mountainous country. A great many rivers, riſing in the fourth and fifth degrees of north latitude, ſpread themſelves over the level part of the country, and fill it with marſhes all the way from ſouth by eaſt to north, or north-weſt.—Theſe marſhes are bounded by mountains, of which thoſe neareſt the marſhes are overgrown with coffee trees, the largeſt, if not the only ones, which grow in this country. The kingdom of Narea Proper is interſperſed with ſmall, unwholeſome, but very fertile valleys. The mountainous country of Caffa adjoins immediately to Narea, and is ſaid to be governed by a ſeparate prince: but the Galla having ſettled themſelves in all the flat ground to the very edge of the marſhes, have in a great meaſure cut off the communication with Abyſſinia for a long time paſt. The Nareans who inhabit the mountainous country have the lighteſt complexion of any people in Abyſſinia; but thoſe who inhabit the borders of the marſhes are perfectly black, and have the features and woolly heads of negroes; but the mountaineers of Narea, and much more thoſe of Caffa, are fair complexioned, more ſo than even the Neapolitans or Sicilians. It is ſaid that ſnow has been ſeen to lie on ſome of the mountains of Caffa; but Mr Bruce imagines this to be a miſtake, and thinks that it muſt have been hail.

Narea abounds with cattle, grain and all kinds of proviſions, both in the high and low country. The medium of commerce is gold, which they ſell by weight; but the principle articles of trade are coarſe cotton cloths, antimony, beads, and incenſe, which are carried from this country to the kingdom of Angola, and the parts of the African continent towards the Atlantic. The people are exceedingly brave; and though they had been driven out of the low country by multitudes of Galla, they now bid them defiance, and drive them from their frontiers whenever they come too near. The Narean priſoners taken in theſe ſkirmiſhes are ſold to the Mahometan merchants at Gondar; and at Conſtantinople, Cairo, or in India, the women are more eſteemed than theſe of any other part of the world. Both ſexes have a cheerful, kind diſpoſition, and attach themſelves inviolably to their maſters, if properly treated. The people of Narea and Caffa ſpeak a language peculiar themſelves.

NARRATION, in oratory, poetry, and hiſtory, a recital or rehearſal of a fact as it happened, or as it is ſuppoſed to have happened. See ORATORY, n° 26. 123.

Concerning NARRATION *and Deſcription*, we have the following rules and obſervations in the Elements of Criticiſm.

1. The firſt rule is, That in hiſtory the reflections ought to be chaſte and ſolid; for while the mind is intent upon truth, it is little diſpoſed to the operation of the imagination. Strada's Belgic hiſtory is full of poetical images, which, being diſcordant with the ſubject, are unpleaſant; and they have a ſtill worſe effect, by giving an air of fiction to a genuine hiſtory. Such flowers ought to be ſcattered with a ſparing hand, even in epic poetry; and at no rate are they proper till the reader be warmed, and by an enlivened imagination be prepared to reliſh them: in that ſtate of mind, they are agreeable; but while we are ſedate and attentive to an hiſtorical chain of facts, we reject with diſdain every fiction.

2. Vida, following Horace, recommends a modeſt commencement of an epic poem; giving for a reaſon, that the writer ought to huſband his fire. Beſides, bold thoughts and figures are never reliſhed till the mind be heated and thoroughly engaged, which is not the reader's caſe at the commencement. Homer introduces not a ſingle ſimile in the firſt book of the Iliad, nor in the firſt book of the Odyſſey. On the other hand, Shakeſpeare begins one of his plays with a ſentiment too bold for the moſt heated imagination:

> *Bedford.* Hung be the heav'ns with black, yield day to night!
> Comets, importing change of times and ſtates,
> Brandiſh your cryſtal treſſes in the ſky,
> And with them ſcourge the bad revolting ſtars,
> That have conſented unto Henry's death!
> Henry the Fifth, too famous to live long!
> England ne'er loſt a king of ſo much worth.
>
> *Firſt part Henry VI.*

The paſſage with which Strada begins his hiſtory, is too poetical for a ſubject of that kind: and at any rate too high for the beginning of a grave performance.

3. A third rule or obſervation is, That where the ſubject is intended for entertainment ſolely, not for inſtruction, a thing ought to be deſcribed as it appears, not as it is in reality. In running, for example, the impulſe upon the ground is proportioned in ſome degree to the celerity of motion; though in appearance it is otherwiſe, for a perſon in ſwift motion ſeems to ſkim the ground, and ſcarcely to touch it. Virgil, with great taſte, deſcribes quick running according to appearance; and raiſes an image far more lively than by adhering ſcrupulouſly to truth:

> Hos ſuper advenit volſca de gente Camilla,
> Agmen agens equitum et florentes ære catervas,
> Bellatrix: non illa colo calathiſve Minervæ
> Fœmineas aſſueta manus; ſed prœlia virgo
> Dura pati, curſuque pedum prævertere ventos.
> Illa vel intactæ ſegetis per ſumma volaret
> Grammina: nec teneras curſu læſiſſet ariſtas:
> Vel mare per medium, fluctu ſuſpenſa tumenti,
> Ferret iter: celeris nec tingeret æquore plantas.
>
> *Æneid.* vii. 803.

4. In narration as well as in deſcription, objects ought to be painted ſo accurately as to form in the mind of the reader diſtinct and lively images. Every uſeleſs circumſtance ought indeed to be ſuppreſſed, becauſe every ſuch circumſtance loads the narration: but if a circumſtance be neceſſary, however ſlight, it cannot be deſcribed too minutely. The force of language conſiſts in raiſing complete images, which have the effect to tranſport the reader as by magic into the very place of the important action, and to convert him as it were into a ſpectator, beholding every thing that paſſes. The narrative in an epic poem ought to rival a picture in the livelineſs and accuracy of its repreſentations: no circumſtance muſt be omitted that tends to make a complete image; becauſe an imperfect image, as well as any other imperfect conception, is cold and uninterreſting. We ſhall illuſtrate this rule by ſeveral examples giving the firſt place to a beautiful paſſage from Virgil:

> Qualis *populea* mœrens Philomela ſub umbra
> Amiſſos queritur fœtus, quos durus *arator*
> Obſervans nido *implumes* detraxit.
>
> *Georg. lib.* 4. *l.* 511.

The poplar, plowman, and unfledged young, though not eſſential in the deſcription, tend to make a complete image, and upon that account are an embelliſhment.

Again:

Hic viridem Æneas *frondenti ex ilice* metam
Conſtituit, ſignum nautis. *Æneid.* v. 129.

Horace addreſſing to fortune:

Te pauper ambit ſolicita prece
Ruris colonus: te dominam æquoris,
Quicumque Bithyná laceſſit
Carpathium pelagus cariná.
Carm. lib. 1. *ode* 35.

—— Illum ex mœnibus hoſticis
Matrona bellantis tyranni
Proſpiciens, et adulta virgo,
Suſpiret: Eheu, ne rudis agminum
Sponſus laceſſat regius aſperum
Tactu leonum, quem cruenta
Per medias rapit ira cædes.
Carm. lib. 3. *ode* 2.

Shakeſpeare ſays, "You may as well go about to turn the ſun to ice by fanning in his face with a *peacock's* feather." The peacock's feather, not to mention the beauty of the object, completes the image: an accurate image cannot be formed of that fanciful operation, without conceiving a particular feather; and one is at a loſs when this is neglected in the deſcription. Again, "The rogues ſlighted me into the river with as little remorſe, as they would have drown'd a bitch's blind puppies, fifteen i'th' litter."

Old Lady. You would not be a queen.
Anne. No, not for all the riches under heaven.
Old Lady. 'Tis ſtrange: a three-pence bow'd would hire me, old as I am, to queen it.
Henry VIII. act. 2. *ſc.* 5.

In the following paſſage, the action, with all its material circumſtances, is repreſented ſo much to the life, that it would ſcarce appear more diſtinct to a real ſpectator; and it is the manner of deſcription that contributes greatly to the ſublimity of the paſſage.

He ſpake; and, to confirm his words, out flew
Millions of flaming ſwords, drawn from the thighs
Of mighty cherubim; the ſudden blaze
Far round illumin'd hell: highly they rag'd
Againſt the Higheſt, and fierce with graſped arms,
Claſh'd on their ſounding ſhields the din of war,
Hurling defiance toward the vault of heav'n.
Milton. b. 1.

The following paſſage from Shakeſpeare falls not much ſhort of that now mentioned in particularity of deſcription:

O you hard hearts! you cruel men of Rome!
Knew you not Pompey? Many a time and oft
Have you climb'd up to walls and battlements,
To tow'rs and windows, yea, to chimney-tops,
Your infants in your arms: and there have ſat
The live-long day with patient expectation
To ſee great Pompey paſs the ſtreets of Rome;
And when you ſaw his chariot but appear,
Have you not made an univerſal ſhout,
That Tyber trembled underneath his banks,
To hear the replication of your ſounds,
Made in his concave ſhores?
Julius Cæſar, act. 1. *ſc* 1.

The following paſſage is ſcarce inferior to either of thoſe mentioned:

"Far before the reſt, the ſon of Oſſian comes: bright in the ſmiles of youth, fair as the firſt beams of the ſun. His long hair waves on his back: his dark brow is half beneath his helmet. The ſword hangs looſe on the hero's ſide; and his ſpear glitters as he moves. I fled from his terrible eye, King of high Temora." *Fingal.*

The Henriade of Voltaire errs greatly againſt the foregoing rule; every incident is touched in a ſummary way, without ever deſcending to circumſtances. This manner is good in a general hiſtory, the purpoſe of which is to record important tranſactions: but in a fable it is cold and unintereſting; becauſe it is impracticable to form diſtinct images of perſons or things repreſented in a manner ſo ſuperficial.

It is obſerved above, that every uſeleſs circumſtance ought to be ſuppreſſed. The crowding ſuch circumſtances is, on the one hand, not leſs to be avoided, than the conciſeneſs for which Voltaire is blamed, on the other. In the Æneid, Barce, the nurſe of Sichæus, whom we never hear of before nor after, is introduced for a purpoſe not more important than to call Anna to her ſiſter Dido: and that it might not be thought unjuſt in Dido, even in this trival circumſtance, to prefer her huſband's nurſe before her own, the poet takes care to inform his reader, that Dido's nurſe was dead. To this may be oppoſed a beautiful paſſage in the ſame book, where, after Dido's laſt ſpeech, the poet, without detaining his readers by deſcribing the manner of her death, haſtens to the lamentation of her attendants:

Dixerat; atque illam media inter talia ferro
Collapſam aſpiciunt comites, enſemque cruore
Spumantem, ſparſaſque manus. It clamor ad alta
Atria, concuſſam bacchatur fama per urbem;
Lamentis gemituque et fœmineo ululatu
Tecta fremunt, reſonat magnis plangoribus æther.
Lib. 4. l. 663.

As an appendix to the foregoing rule, may be added the following obſervation. That to make a ſudden and ſtrong impreſſion, ſome ſingle circumſtance, happily ſelected, has more power than the moſt laboured deſcription. Macbeth, mentioning to his lady ſome voices he heard while he was murdering the King, ſays,

There's one did laugh in ſleep, and one cry'd Murder!
They wak'd each other; and I ſtood and heard them;
But they did ſay their prayers, and addreſs them
Again to ſleep.
Lady. There are two lodg'd together.
Macbeth. One cry'd, God bleſs us! and, Amen! the other;
As they had ſeen me with theſe hangman's hands.
Liſtening their fear, I could not ſay, Amen,
When they did ſay, God bleſs us.
Lady. Conſider it not ſo deeply.
Macbeth. But wherefore could not I pronounce Amen?
I had moſt need of bleſſing, and Amen
Stuck in my throat

Lady. Theſe deeds muſt not be thought
After theſe ways ; ſo, it will make us mad.
Macbeth. Methought, I heard a voice cry,
Sleep no more !
Macbeth doth murder ſleep, &c. *Act* 2. *ſc*. 3.

Deſcribing prince Henry :

I ſaw young Harry, with his beaver on,
His cuiſſes on his thighs, gallantly arm'd,
Riſe from the ground like feather'd Mercury ;
And vaulted with ſuch eaſe into his ſeat,
As if an angel dropt down from the clouds,
To turn and wind a fiery Pegaſus,
And witch the world with noble horſemanſhip.
Firſt part Henry IV. act 4 *ſc*. 2.

King Henry. Lord Cardinal, if thou think'ſt on
Heaven's bliſs.
Hold up thy hand, make ſignal of thy hope.
He dies, and makes no ſign !
Second part Henry VI act. 3. *ſc*. 10.

The ſame author, ſpeaking ludicrouſly of an army debilitated with diſeaſes, ſays,

" Half of them dare not ſhake the ſnow from off their caſſocks, leſt they ſhake themſelves to pieces."

" I have ſeen the walls of Balclutha, but they were deſolate. The flames had reſounded in the halls : and the voice of the people is heard no more. The ſtream of Clutha was removed from its place by the fall of the walls. The thiſtle ſhook there its lonely head : the moſs whiſtled to the wind. The fox looked out from the windows ; and the rank graſs of the wall waved round his head. Deſolate is the dwelling of Morna : ſilence is in the houſe of her fathers." *Fingal*.

To draw a character is the maſter ſtroke of deſcription. In this Tacitus excels : his portraits are natural and lively, not a feature wanting or miſplaced. Shakeſpeare, however, exceeds Tacitus in livelineſs ; ſome characteriſtical circumſtance being generally invented or laid hold of, which paints more to the life than many words. The following inſtances will explain our meaning, and at the ſame time prove our obſervation to be juſt.

Why ſhould a man, whoſe blood is warm within,
Sit like his grandſire cut in alabaſter ?
Sleep when he wakes, and creep into the jaundice,
By being peeviſh ? I tell thee what, Anthonio,
(I love thee, and it is my love that ſpeaks),
There are a ſort of men, whoſe viſages
Do cream and mantle like a ſtanding pond ;
And do a wilful ſtillneſs entertain,
With purpoſe to be dreſs'd in an opinion
Of wiſdom, gravity, profonnd conceit :
As who ſhould ſay, I am Sir Oracle,
And when I ope my lips, let no dog bark !
O my Anthonio ! I do know of thoſe,
That therefore only are reputed wiſe,
For ſaying nothing.
Merchant of Venice, act. 1. *ſc*. 2.

Again :

" Gratiano ſpeaks an infinite deal of nothing, more than any man in all Venice : his reaſons are two grains of wheat hid in two buſhels of chaff ; you ſhall ſeek all day ere you find them ; and when you have them, they are not worth the ſearch." *Ibid*.

In the following paſſage, a character is completed by a ſingle ſtroke :

Shallow. O the mad days that I have ſpent ; and to ſee how many of mine old acquaintance are dead.

Silence. We ſhall all follow, couſin.

Shallow. Certain, 'tis certain, very ſure, very ſure ; Death (as the Pſalmiſt ſaith) is certain to all : all ſhall die. How good a yoke of bullocks at Stamford fair ?

Slender. Truly, couſin, I was not there.

Shallow. Death is certain. Is old *Double* of your town living yet ?

Silence. Dead, Sir.

Shallow. Dead ! ſee, ſee ; he drew a good bow : and dead. He ſhot a fine ſhoot. How a ſcore of ewes now ?

Silence. Thereafter as they be. A ſcore of good ewes may be worth ten pounds.

Shallow. And is old *Double* dead ?

Second Part Henry IV. *act*. 3. *ſc*. 3.

Deſcribing a jealous huſband :

" Neither preſs, coffer, cheſt, trunk, well, vault, but he hath an abſtract for the remembrance of ſuch places, and goes to them by his note. There is no hiding you in the houſe." *Merry Wives of Windſor, act*. 4. *ſc*. 3.

Congreve has an inimitable ſtroke of this kind in his comedy of *Love for Love :*

Ben Legend. Well, father, and how do all at home ? how does brother Dick, and brother Val ?

Sir Sampſon. Dick, body o' me, Dick has been dead theſe two years. I writ you word when you were at Leghorn.

Ben. Meſs, that's true ; marry, I had forgot. Dick's dead, as you ſay. *Act*. 3. *ſc*. 6.

Falſtaff ſpeaking of Ancient Piſtol :

" He's no ſwaggerer, hoſteſs ; a tame chearer i'faith ; you may ſtroak him as gently as a puppy-greyhound ; he will not ſwagger with a Barbary hen, if her feathers turn back in any ſhow of reſiſtance."

Second part Henry IV. *act*. 2. *ſc*. 9.

Oſſian among his other excellencies is eminently ſucceſsful in drawing characters ; and he never fails to delight his reader with the beautiful attitudes of his heroes. Take the following inſtances :

" O Oſcar ! bend the ſtrong in arm ; but ſpare the feeble hand. Be thou a ſtream of many tides againſt the foes of thy people ; but like the gale that moves the graſs to thoſe who aſk thine aid.—So Trenmor lived ; ſuch Trathal was ; and ſuch has Fingal been. My arm was the ſupport of the injured ; and the weak reſted behind the lightning of my ſteel."

" We heard the voice of joy on the coaſt, and we thought that the mighty Cathmor came. Cathmor the friend of ſtrangers ! the brother of red-haired Cairbar ! But their ſouls were not the ſame ; for the light of heaven was in the boſom of Cathmor. His towers roſe on the banks of Atha : ſeven paths led to his hills : ſeven chiefs ſtood on theſe paths, and called the ſtranger to the feaſt. But Cathmor dwelt in the wood to avoid the voice of praiſe."

" Dermid and Oſcar were one : they reaped the battle together. Their friendſhip was ſtrong as their

Narration. ſteel; and death walked between them to the field. They ruſh on the foe like two rocks falling from the brow of Ardven. Their ſwords are ſtained with the blood of the valiant: warriors faint at their name. Who is equal to Oſcar but Dermid? who to Dermid but Oſcar?"

"Son of Comhal, replied the chief, the ſtrength of Morni's arm has failed; I attempted to draw the ſword of my youth, but it remains in its place: I throw the ſpear but it falls ſhort of the mark: and I feel the weight of my ſhield. We decay like the graſs of the mountain, and our ſtrength returns no more. I have a ſon, O Fingal! his ſoul has delighted in the actions of Morni's youth; but his ſword has not been fitted againſt the foe, neither has his fame begun. I come with him to battle, to direct his arm. His renown will be a ſun to my ſoul, in the dark hour of my departure. O that the name of *Morni* were forgot among the people! that the heroes would only ſay, *Behold the father of Gaul.*"

Some writers, through heat of imagination, fall into contradiction; ſome are guilty of downright abſurdities; and ſome even rave like madmen. Againſt ſuch capital errors one cannot be more effectually warned than by collecting inſtances; and the firſt ſhall be of a contradiction, the moſt venial of all. Virgil ſpeaking of Neptune.

> Interea magno miſceri murmure pontum,
> Emiſſamque hiemem ſenſit Neptunus, et imis
> Stagna refuſa vadis: *graviter commotus*, et alto
> Proſpiciens, ſummâ *placidum* caput extulit undà
>
> *Æneid.* i. 128.

Again:

> When firſt young Maro, in his boundleſs mind,
> A work t'outlaſt *immortal* Rome deſign'd.
>
> *Eſſay on Criticiſm, l.* 30.

The following examples are abſurdities.

"Alii pulſis e tormento catenis diſcerpti ſectique, dimidiato corpore pugnabant ſibi ſuperſtites, ac peremptæ partis ultores." *Strada, dec.* 2. *l.* 2.

> Il povér huomo, che non ſen' era accorto,
> Andava combattendo, ed era morto *Berni*
>
> He fled, but flying, left his life behind.
>
> *Iliad*, xi. 443.
>
> Full through his neck the weighty falchion ſped:
> Along the pavement roll'd the mutt'ring head.
>
> *Odyſſey*, xxii. 365.

The laſt article is of raving like one mad. Cleopatra ſpeaking to the aſpic,

> ——————Welcome, thou kind deceiver,
> Thou beſt of thieves; who with an eaſy key,
> Doſt open life, and unperceiv'd by us
> Ev'n ſteal us from ourſelves; diſcharging ſo
> Death's dreadful office, better than himſelf;
> Touching our limbs ſo gently into ſlumber,
> That Death ſtands by, deceiv'd by his own image,
> And thinks himſelf but ſleep.
>
> *Dryden, All for Love, act* 5.

Having diſcuſſed what obſervations occurred upon the thoughts or things expreſſed, we proceed to what more peculiarly concerns the laguage or verbal dreſs. As words are intimately connected with the ideas they repreſent, the emotions raiſed by the ſound and by the ſenſe ought to be concordant. An elevated ſubject requires an elevated ſtyle; what is familiar, ought to be familiarly expreſſed: a ſubject that is ſerious and important, ought to be clothed in plain nervous language: a deſcription, on the other hand, addreſſed to the imagination, is ſuſceptible of the higheſt ornament that ſounding words and figurative expreſſion can beſtow upon it.

We ſhall give a few examples of the foregoing rules. A poet of any genius is not apt to dreſs a high ſubject in low words: and yet blemiſhes of that kind are found even in claſſical works. Horace obſerving that men are ſatisfied with themſelves, but ſeldom with their condition, introduces Jupiter indulging to each his own choice:

> Jam faciam quod vultis; eris tu, qui modo miles,
> Mercator; tu, conſultus modo, ruſticus: hinc vos,
> Vos hinc mutatis diſcedite partibus: eia,
> Quid ſtatis? nolint: atqui licet eſſe beatis.
> Quid cauſæ eſt, merito quin illis *Jupiter ambas*
> *Iratus buccas inflet?* neque ſe fore poſthac
> Tam facilem dicat, votis ut præbeat aurem?
>
> *Sat. lib.* 1. *ſat.* 1. *l.* 15.

Jupiter in wrath puffing up both cheeks, is a low and even ludicrous expreſſion, far from ſuitable to the gravity and importance of the ſubject: every one muſt feel the diſcordance. The following couplet, ſinking far below the ſubject, is no leſs ludicrous:

> Not one looks backward, onward ſtill he goes.
> Yet ne'er looks forward farther than his noſe.
>
> *Eſſay on man, ep.* iv. 223.

On the other hand, to raiſe the expreſſion above the tone of the ſubject, is a fault than which none is more common. Take the following inſtances:

> Orcan le plus fidele á ſerver ſes deſſeins,
> Ne ſous le ciel brûlant des plus noirs Affricains.
>
> *Bajazet act* 3. *ſc.* 8.
>
> Les ombres par trois fois ont obſcurci les cieux
> Depuis que le ſommeil n'eſt entré dans vos yeux;
> Et le jour a trois fois chaſſé la nuit obſcure
> Depuis que votre corps languit ſans nourriture.
>
> *Phedra, act* 1. *ſc.* 3.

Aſſueris. Ce mortel, qui montra tant de zele pour moi, Vit-il encore?

Aſaph.———Il voit l'aſtre qui vous eclaire.

Eſther, act 2. *ſc.* 3.

> Oui, c'eſt Agamemnon c'eſt ton roi qui t'eveille;
> Viens, reconnois la voix qui frappe ton oreille.
>
> *Iphigenie.*

> No jocund health that Denmark drinks to-day,
> But the great cannon to the clouds ſhall tell;
> And the king's rowſe the heav'n ſhall bruit again.
> Reſpeaking earthly thunder.
>
> *Hamlet, act* 1. *ſc.* 2.
>
> ——————In the inner room
> I ſpy a winking lamp, that weakly ſtrikes
> The ambient air, ſcarce kindling into light.
>
> *Southerne, Fate of Capua, act* 3.

In the funeral orations of the biſhop of Meaux, the following paſſages are raiſed far above the tone of the ſubject:

"L'Occean ettonné de ſe voir traverſé tant de fois, èn des [illegible] appareils si divers, et pour des cauſes ſi differentes, &c." *p.* 6.

"Grande reine, je ſatisfais à vos plus tendres deſirs, quand je célèbre ce monarque; et ſon cœur qui n'a jamais vécu que pour lui, ſe réveille, tout poudre qu'il eſt, et devient ſenſible, même ſous ce drap mortuaire, au nom d'un époux ſi cher." *p.* 32.

The following paſſage, intended, one would imagine, as a receipt to boil water, is altogether burleſque by the laboured elevation of the diction:

A maſſy caldron of ſtupendous frame
They brought, and plac'd it o'er the riſing flame:
Then heap the lighted wood; the flame divides
Beneath the vaſe, and climbs around the ſides:
In its wide womb they pour the ruſhing ſtream:
The boiling water bubbles to the brim.
Iliad. xviii. 405.

In a paſſage at the beginning of the 4th book of Telemachus, one feels a ſudden bound upward without preparation, which accords not with the ſubject:

"Calypſo, qui avoit été juſqu'à ce moment immobile et tranſportée de plaiſir en écoutant les avantures de Télémaque, l'interrompit pour lui faira prendre quelque repôs. Il eſt tems, lui dit-elle, que vous alliez goûter la douceur du ſommeil apprés tant de travaux. Vous n'avez rien à craindre ici; tout vous eſt favorable. Abandonnez vous donc à la joye. Goutez la paix, et tous les autres dons des dieux dont vous allez être comblé. Demain, *quand l'Aurore avec ſes doigts de roſes entr'ouvrira les portes dorées de l'Orient, et que le chevaux du Soleil ſortans de l'onde amère répandront les flammes du jour, pour chaſſer devant eux toutes les etoiles du ciel*, nous reprendrons, mon cher Télémaque, l'hiſtoire de vos malheurs."

This obviouſly is copied from a ſimilar paſſage in the Æneid, which ought not to have been copied, becauſe it lies open to the ſame cenſure; but the force of authority is great:

At regina gravi jamdudum ſaucia cura
Vulnus alit venis, et cæco carpitur igni.
Multa viri virtus animo, multuſque recurſat
Gentis honos: hærent infixi pectore vultus,
Verbaque: nec placidam membris dat cura quietem.
Poſtera Phœbea luſtrabat lampade terras,
Humentemque Aurora polo dimoverat umbram;
Cum ſic unanimem alloquitur maleſana ſororem.
Lib. iv. 1.

The language of Homer is ſuited to his ſubject, not leſs accurately than the actions and ſentiments of his heroes are to their characters. Virgil, in that particular, falls ſhort of perfection: his language is ſtately throughout: and though he deſcends at times to the ſimpleſt branches of cookery, roaſting and boiling for example, yet he never relaxes a moment from the high tone.---In adjuſting his languge to his ſubject, no writer equals Swift. We can recollect but one exception, which at the ſame time is far from being groſs: The Journal of a modern Lady is compoſed in a ſtyle blending ſprightlineſs with familiarity, perfectly ſuited to the ſubject: in one paſſage, however, the poet, deviating from that ſtyle, takes a tone above his ſubject. The paſſage we have in view begins *l.* 116. But *let me now a while ſurvey*, &c. and ends at *l.* 135.

It is proper to be obſerved upon this head, that writers of inferior rank are continually upon the ſtretch to enliven and enforce their ſubject by exaggeration and ſuperlatives. This unluckily has an effect contrary to what is intended: the reader, diſguſted with language that ſwells above the ſubject, is led by contraſt to think more meanly of the ſubject than it may poſſibly deſerve. A man of prudence, beſide, will be no leſs careful to huſband his ſtrength in writing than in walking: a writer, too liberal of ſuperlatives, exhauſts his whole ſtock upon ordinary incidents, and reſerves no ſhare to expreſs, with greater energy, matters of importance.

Many writers of that kind abound ſo in epithets, as if poetry conſiſted entirely in high-ſounding words. Take the following inſtance:

When black-brow'd night her duſky mantle ſpread,
  And wrapt in ſolemn gloom the ſable ſky;
When [illegible] opiate dews had ſhed,
  And ſeal'd in ſilken ſlumbers every eye:
My [illegible] balmy bed,
  Nor the ſweet bliſs of ſoft oblivion ſhare:
But watchful wo diſtracts my aching breaſt,
  My heart the ſubject of corroding care:
From haunts of men with wandring ſteps and ſlow
I ſolitary ſteal, and ſoothe my penſive wo.

Here every ſubſtantive is faithfully attended by ſome tumid epithet.

We proceed to a ſecond remark, not leſs important than the former. No perſon of reflection but muſt be ſenſible, that an incident makes a ſtronger impreſſion on an eye witneſs, than when heard at ſecond-hand. Writers of genius, ſenſible that the eye is the beſt avenue to the heart, repreſent every thing as paſſing in our ſight; and, from readers or hearers, transform us as it were into ſpectators: a ſkilful writer conceals himſelf, and preſents his perſonages: in a word, every thing becomes dramatic as much as poſſible. Plutarch, *de gloria Athenienſium*, obſerves, that Thucydides makes his reader a ſpectator, and inſpires him with the ſame paſſions as if he were an eye-witneſs.

In the fine arts, it is a rule to put the capital objects in the ſtrongeſt point of view; and even to preſent them oftener than once, where it can be done. In hiſtory-painting, the principal figure is placed in the front, and in the beſt light: an equeſtrian ſtatue is placed in a centre of ſtreets, that it may be ſeen from many places at once. In no compoſition is there greater opportunity for this rule than in writing:

————Sequitur pulcherrimus Aſtur,
Aſtur equo fidens et verſicoloribus armis.
Æneid. x. 180.

——————Full many a lady
I've ey'd with beſt regard, and many a time
Th' harmony of their tongues hath into bondage
Brought my too diligent ear: for ſeveral virtues
Have I lik'd ſeveral women; never any
With ſo full ſoul, but ſome defect in her
Did quarrel with the nobleſt grace ſhe ow'd,
And put it to the foil. But you, O you,
So perfect, and ſo peerleſs, are created
Of every creature's beſt. *Tempeſt, act* 3. *ſc.* 1.
Or[illegible]

Narration.

Orlando. ——Whate'er you are
That, in this deſert inacceſſible,
Under the ſhade of melancholy boughs,
Loſe and neglect the creeping hours of time;
If ever you have look'd on better days;
If ever been where bells have knoll'd to church;
If ever ſat at any good man's feaſt;
If ever from your eye-lids wip'd a tear,
And know what 'tis to pity, and be pity'd;
Let gentleneſs my ſtrong enforcement be,
In the which hope I bluſh, and hide my ſword.
Duke ſen. True is it that we have ſeen better days;
And have with holy bell been knoll'd to church;
And ſat at good mens feaſts; and wip'd our eyes
Of drops that ſacred pity had engender'd:
And therefore ſit you down in gentleneſs,
And take upon command what help we have,
That to your wanting may be miniſtred.

As you like it.

With thee converſing I forget all time;
All ſeaſons and their change, all pleaſe alike.
Sweet is the breath of morn, her riſing ſweet,
With charm of earlieſt birds; pleaſant the ſun
When firſt on this delightful land he ſpreads
His orient beams on herb, tree, fruit, and flow'r
Gliſtring with dew; fragrant the fertile earth
After ſoft ſhowers; and ſweet the coming on
Of grateful ev'ning mild, the ſilent night
With this her ſolemn bird, and this fair moon,
And theſe the gems of heav'n, her ſtarry train:
But neither breath of morn, when ſhe aſcends
With charm of earlieſt birds, nor riſing ſun
On this delightful land, nor herb, fruit, flow'r,
Gliſt'ring with dew, nor fragrance after ſhow'rs,
Nor grateful ev'ning mild, nor ſilent night,
With this her ſolemn bird, nor walk by moon,
Or glittering ſtar light, without thee is ſweet.

Paradiſe Loſt, book 4. *l.* 634.

"What mean ye, that ye uſe this proverb, The fathers have eaten ſour grapes, and the childrens teeth are ſet on edge? As I live, ſaith the Lord God, ye ſhall not have occaſion to uſe this proverb in Iſrael. If a man keep my judgments to deal truly, he is juſt, he ſhall ſurely live. But if he beget a ſon that is a robber, a ſhedder of blood; if he have eaten upon the mountains, and defiled his neighbour's wife; if he have oppreſſed the poor and needy, have ſpoiled by violence, have not reſtored the pledge, have lift up his eyes to idols, have given forth upon uſury, and have taken increaſe: ſhall he live? he ſhall not live: he ſhall ſurely die, and his blood ſhall be upon him. Now, lo, if he beget a ſon, that ſeeth all his father's ſins, and conſidereth, and doeth not ſuch like; that hath not eaten upon the mountains, hath not lift up his eyes to idols, nor defiled his neighbour's wife, hath not oppreſſed any, nor withheld the pledge, neither hath ſpoiled by violence, but hath given his bread to the hungry, and covered the naked with a garment; that hath not received uſury nor increaſe, that hath executed my judgments, and walked in my ſtatutes: he ſhall not die for the iniquity of his father; he ſhall ſurely live. The ſoul that ſinneth, it ſhall die; the ſon ſhall not bear the iniquity of the father, neither ſhall the father bear the iniquity of the ſon; the righteouſneſs of the righteous ſhall be upon him, and the wickedneſs of the wicked ſhall be upon him. Have I any pleaſure that the wicked ſhould die, ſaith the Lord God; and not that he ſhould return from his ways, and live?" *Ezekiel* xviii.

A conciſe comprehenſive ſtyle is a great ornament in narration; and a ſuperfluity of unneceſſary words, not leſs than of circumſtances, a great nuiſance. A judicious ſelection of the ſtriking circumſtances, clothed in a nervous ſtyle, is delightful. In this ſtyle, Tacitus excels all writers, ancient and modern. Inſtances are numberleſs: take the following ſpecimen:

"Crebra hinc prælia, et ſæpius in modum latrocinii: per ſaltus, per paludes: ut cuique ſors aut virtus: temere, proviſo, ob iram, ob prædam, juſſu, et aliquando ignaris ducibus." *Annal. lib.* 12. § 39.

After Tacitus, Oſſian in that reſpects juſtly merits the place of diſtinction. One cannot go wrong for examples in any part of the book.

If a conciſe or nervous ſtyle be a beauty, tautology muſt be a blemiſh; and yet writers, fettered by verſe, are not ſufficiently careful to avoid this ſlovenly practice: they may be pitied, but they cannot be juſtified. Take for a ſpecimen the following paſſages, from the beſt poet, for verſification at leaſt, that England has to boaſt off:

High on his helm celeſtial lightnings play,
His beamy ſhield emits a living ray;
Th' unweary'd blaze inceſſant ſtreams ſupplies,
Like the red ſtar that fires the autumnal ſkies.

Iliad v. 5.

Strength and omnipotence inveſt thy throne.

Ibid. viii. 576.

So ſilent fountains, from a rock's tall head,
In ſable ſtreams ſoft trickling waters ſhed.

Ibid. ix. 19.

His clanging armour rung. *Ibid.* xii. 94.

Fear on their cheek, and horror in their eye.

Ibid. xv. 4.

The blaze of armour flaſh'd againſt the day.

Ibid. xvii. 736.

As when the piercing blaſts of Boreas blow.

Ibid. xix. 380.

And like the moon, the broad refulgent ſhield
Blaz'd with long rays, and gleam'd athwart the field.

Ibid. xix. 402.

No—could our ſwiftneſs o'er the winds prevail,
Or beat the pinions of the weſtern gale,
All were in vain—— *Ibid.* xix. 460.
The humid ſweat from ev'ry pore deſcends.

Ibid. xxiii. 829.

We cloſe this article with a curious inquiry. An object, however ugly to the ſight, is far from being ſo when repreſented by colours or by words. What is the cauſe of this difference? With reſpect to painting, the cauſe is obvious: a good picture, whatever the ſubject be, is agreeable by the pleaſure we take in imitation; and this pleaſure overbalancing the diſagreeable emotion of the ſubject, makes the picture upon the whole agreeable. With reſpect to the deſcription of an ugly object, the cauſe follows. To connect individuals in the ſocial ſtate, no particular contributes more than language, by the power it poſſeſſes of an expeditious communication of thought, and a lively repreſentation of tranſactions. But nature hath not been ſatiſfied to recommend language by its utility merely: independent of utility, it is made ſuſceptible of many beauties, which are directly felt, without any intervening reflection. And this unfolds the myſtery; for the pleaſure of language is ſo great, as in a lively deſcription to overbalance the diſagreeableneſs of the image raiſed by it. This, however, is no encouragement to chooſe a diſagreeable ſubject; for the pleaſure is incomparably greater where the ſubject and the deſcription are both of them agreeable.

The following deſcription is upon the whole agreeable, though the ſubject deſcribed is in itſelf diſmal:

Nine times the ſpace that meaſures day and night
To mortal men, he with his horrid crew
Lay vanquiſh'd, rolling in the fiery gulf,
Confounded though immortal! but his doom
Reſerv'd him to more wrath; for now the thought
Both of loſt happineſs and laſting pain
Torments him; round he throws his baleful eyes
That witneſs'd huge affliction and diſmay:
Mix'd with obdurate pride and ſtedfaſt hate:
At once as far as angels ken he views
The diſmal ſituation waſte and wild:
A dungeon horrible, on all ſides round
As one great furnace flamed; yet from thoſe flames
No light, but rather darkneſs viſible
Serv'd only to diſcover ſights of wo,
Regions of ſorrow, doleful ſhades, where peace
And reſt can never dwell, hope never comes
That comes to all; but torture without end
Still urges, and a fiery deluge, fed
With ever-burning ſulphur unconſum'd!
Such place eternal juſtice had prepar'd
For thoſe rebellious. *Paradiſe Loſt, book* 1. *l.* 50.

An unmanly depreſſion of ſpirits in time of danger is not an agreeable ſight; and yet a fine deſcription or repreſentation of it will be reliſhed:

K. Richard. What muſt the king do now? muſt
he ſubmit?
The king ſhall do it; muſt he be depos'd?
The king ſhall be contented: muſt he loſe
The name of king? o' God's name let it go;
I'll give my jewels for a ſet of beads;
My gorgeous palace for a hermitage;
My gay apparel, for an almſman's gown;
My figur'd goblets, for a diſh of wood;
My ſceptre, for a palmer's walking-ſtaff;
My ſubjects, for a pair of carved ſaints;
And my large kingdom, for a little grave;
A little, little grave,——an obſcure grave.
Or I'll be bury'd in the king's highway;
Some way of common tread, where ſubjects feet
May hourly trample on their ſovereign's head;
For on my heart they tread now, whilſt I live;
And, bury'd once, why not upon my head?
Richard II. act. 3. *ſc.* 6.

Objects that ſtrike terror in a ſpectator, have in poetry and painting a fine effect. The picture, by raiſing a ſlight emotion of terror, agitates the mind; and in that condition every beauty makes a deep impreſſion. May not contraſt heighten the pleaſure, by oppoſing our preſent ſecurity to the danger of encountering the beaſt repreſented:

——————The other ſhape,
If ſhape it might be call'd that ſhape had none
Diſtinguiſhable in member, joint, or limb;
Or ſubſtance might be call'd that ſhadow ſeem'd,
For each ſeem'd either; black it ſtood as night,
Fierce as ten furies, terrible as hell,
And ſhook a dreadful dart. *Par. Loſt, b.* 2. *l.* 666.

——————Now ſtorming fury roſe,
And clamour ſuch as heard in heaven till now
Was never: arms on clamour claſhing bray'd
Horrible diſcord, and the madding wheels
Of brazen chariots rage; dire was the noiſe
Of conflict; overhead the diſmal hiſs
Of fiery darts in flaming vollies flew,
And flying vaulted either hoſt with fire.
So under fiery cope together ruſh'd
Both battles main, with ruinous aſſault
And inextinguiſhable rage: all heaven
Reſounded, and had earth been then, all earth
Had to her centre ſhook. *Ibid. book* 6. *l.* 207.

Ghoſt.——————But that I am forbid
To tell the ſecrets of my priſon-houſe,
I could a tale unfold, whoſe lighteſt word
Would harrow up thy ſoul, freeze thy young blood,
Make thy two eyes, like ſtars, ſtart from their ſpheres,
Thy knotty and combined locks to part,
And each particular hair to ſtand on end,
Like quills upon the fretful porcupine:
But this eternal blazon muſt not be
To ears of fleſh and blood. *Hamlet, act* 1. *ſc.* 8.

Gratiano. Poor Deſdemona! I'm glad thy father's
dead:
Thy match was mortal to him; and pure grief
Shore his old thread in twain. Did he live now,
This ſight would make him do a deſp'rate turn:
Yea, curſe his better angel from his ſide,
And fall to reprobation. *Othello, act* 5. *ſc.* 8.

Objects of horror muſt be excepted from the foregoing theory; for no deſcription, however lively, is ſufficient to overbalance the diſguſt raiſed even by the idea of ſuch objects. Every thing horrible ought therefore to be avoided in a deſcription.

NARSES, the eunuch who rivalled Beliſarius in heroiſm under the reign of the emperor Juſtinian, emerged from obſcurity A. D. 538. From the domeſtic ſervice of the palace, and the adminiſtration of the private revenue, he was ſuddenly exalted to the head of an army. He is ranked among the few eunuchs who have reſcued that unhappy name from the contempt and hatred of mankind. A feeble diminutive body concealed the ſoul of a ſtateſman and a warrior. His youth had been employed in the management of the loom and diſtaff, in the cares of the houſehold, and the ſervice of female luxury; but, while his hands were buſy, he ſecretly exerciſed the faculties of a vigorous and diſcerning mind. A ſtranger to the ſchools and the camp, he ſtudied in the palace to diſſemble, to flatter, and to perſuade; and as ſoon as he approached the perſon of the emperor, Juſtinian liſtened with ſurpriſe and pleaſure to the manly counſels of his chamberlain and private treaſurer. The talents of Narſes were tried and improved in frequent embaſſies; he led an army into Italy, acquired a practical knowledge of the war and the country, and preſumed to ſtrive with the genius of Beliſarius. Twelve years after his return, the eunuch was choſen to achieve the conqueſt which had been left imperfect by the firſt of the Roman generals. Inſtead of being dazzled by vanity or emulation, he ſeriouſly declared, that unleſs he were armed with an adequate force, he would never conſent to riſk his own glory and that of his ſovereign. Juſtinian granted to the favourite what he might have denied to the hero: the Gothic war was rekindled from its aſhes, and the preparations were not unworthy of the ancient majeſty of the empire.

Narſes defeated the Goths, the Franks, and the Alemanni: the Italian cities opened their gates to the conqueror: he entered the capital in triumph: and having eſtabliſhed the ſeat of his government at Ravenna, continued 15 years to govern Italy under the title of *Exarch*.

His virtues, we are told, were ſtained with avarice: and in this provincial reign he accumulated a treaſure of gold and ſilver which ſurpaſſed the modeſty of a private fortune. His government was oppreſſive or unpopular: and the general diſcontent was expreſſed with freedom by the deputies of Rome. Before the throne of Juſtinian they boldly declared, that their Gothic ſervitude had been more tolerable than the deſpotiſm of a Greek eunuch; and that unleſs their tyrant were inſtantly removed, they would conſult their own happineſs in the choice of a maſter. Thus was his diſgrace the effect of the people's diſaffection; and his death, though in the extreme period of old age, was unſeaſonable and premature, ſince his genius alone could have repaired the laſt and fatal error of his life He died about the year 567, and, as ſome ſay, at the advanced age of 95; but this does not appear very probable. See Gibbon's Rom. Hiſt. vol. iv. 4to edit. p. 194. 298, &c.

NARVA, a ſtrong town of the Ruſſian empire, in Livonia with a caſtle and a harbour. It was taken by the Muſcovites from the Danes in 1558, by the Swedes in 1581, and they defeated the Muſcovites near it in 1700: but it was retaken by the Ruſſians in 1704 by ſtorm, and the inhabitants ſent to Aſtracan. It is ſeated on the river Narva, 95 miles S.W. of Wiburg, and 172 N. E. of Riga. E. Long. 29. 0. N. Lat. 59. 8.

NARWAL, in ichthyology. See MONODON.

NASSAU-SIEGEN, a ſmall principality of Germany in the Weſterwalde, is in general a mountainous woody country, with ſome arable and paſture ground, and a good breed of cattle. Its manufactures are chiefly thoſe of iron and ſteel, having an iron mine in the neighbourhood of Siegen. Count John the Younger, in 1626, embraced the Roman Catholic religion, and endeavoured to introduce it into the country: but the principality, upon the extinction of the line of Naſſau-Siegen in 1743, falling to the line of Naſſau-Dietz, and therein to the prince of Orange, hereditary ſtadtholder of the United Provinces, the Proteſtants were delivered from their apprehenſions of Popiſh tyranny and bigotry. The prince, on account of theſe territories, has a ſeat and voice at the diets of the empire and circle in the college of princes. His aſſeſſment in the matricula for Naſſau Siegen is 773 florins monthly; and towards the maintainance of the chamber-judicatory, 50 rix-dollars ſix kruitzers and a half each term, The revenue of this principality is eſtimated at 100,000 rix-dollars.

NASSAU-Dillenbourgh a principality of Germany, ſituated near the former. It has not much arable land, but plenty of wood, good quarries of ſtone, ſome ſilver and vitriol, copper and lead, with ſtore of iron for the working and ſmelting of which there are many forges and founderies in the country; and by theſe, and the ſale of their iron, the inhabitants chiefly ſubſiſt. Calviniſm is the religion of the principaliy, which contains five towns and two boroughs, and belongs entirely to William V. prince of Orange, and hereditary ſtadtholder of the United Provinces, whoſe father ſucceeded to a part of it in 1739 on the death of prince Chriſtian, and to the reſt in 1743 on the death of prince William Hyacynth of Siegen. The prince, on account of this principality alſo and Dietz, has a ſeat and voice in the college of princes, at the diets of the empire and circle. His aſſeſſment in the matricula, for Naſſau-Dillenbourg, is 102 florins monthly; and to the chamber-judicatory, 50 rix-dollars, ſix and a half kruitzers, each term. His revenue from this principality is computed at above 130,000 florins.

NASSAU-Hadamar, a county of Germany, which, till the year 1711, had princes of its own; but now belongs wholly to William V. prince of Orange.

NASSAU, prince of Orange. See MAURICE.

NATES, in anatomy, a term expreſſing thoſe two fleſhy exterior parts of the body vulgarly called the *buttocks*, See ANATOMY.

NATES Cerebri, are two circular protruberances of the brain, ſituated on the back ſide of the medula oblongata, near the cerebellum.

NATION, a collective term, uſed for a conſiderable number of people inhabiting a certain extent of land, confined within fixed limits, and under the ſame government.

NATIONAL DEBT: the money owing by government.

Our limits permit us to give but a very general ſketch of this ſubject: However as it is of conſiderable importance to every inhabitant of theſe kingdoms, we ſhall endeavour to give as clear and comprehenſive a view of it as the bounds neceſſarily preſcribed us will admit. In order to this, it may not be improper to refer back to the times that have gone before us, that we may the better diſcover the nature of public revenues, the manner of their expenditure, and the cauſes of public debt.

In that rude ſtate of ſociety which precedes the extenſion of commerce and the improvements of manufactures, when thoſe expenſive luxuries which commerce and manufactures can alone introduce, are altogether unknown; the perſon who poſſeſſes a large revenue can ſpend or enjoy that revenue or in no other way than by maintaining nearly as many people as it can maintain. Among our feudal anceſtors, the long time during which eſtates uſed to continue in the ſame family ſufficiently demonſtrates the general diſpoſition of people to live within their income. Though the ruſtic hoſpitality conſtantly exerciſed by the great landholders may not to us in the preſent time ſeem

Smith's Wealth of Nations.

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National. consiſtent with that order which we are apt to conſider as inſeparably connected with good economy, yet we must certainly allow them to have been at leaſt ſo far frugal as not commonly to have ſpent their whole income. Some part of their money, perhaps, they ſpent in purchaſing the few objects of vanity and luxury with which the circumſtances of the times could furniſh them; but ſome part of it they ſeem commonly to have hoarded. They could not well indeed do any thing elſe but hoard whatever money they ſaved. To trade was diſgraceful to a gentleman; and to lend money at intereſt, which at that time was conſidered as uſury and prohibited by law, would have been ſtill more ſo.

The ſame diſpoſition to ſave and to hoard prevailed in the ſovereign as well as in the ſubjects. Among nations to whom commerce and manufactures are little known, the ſovereign is in a ſituation which naturally diſpoſes him to the parſimony requiſite for accumulation. In that ſituation the expence even of a ſovereign cannot be directed by that vanity which delights in the gaudy finery of a court. The ignorance of the times affords but few of the trinkets in which that finery conſiſts. Standing armies are not then neceſſary: ſo that the expence even of a ſovereign, like that of any other great lord, can be employed in ſcarce any thing but bounty to his tenants and hoſpitality to his retainers. But bounty and hoſpitality very ſeldom lead to extravagance: though vanity almoſt always does. All the ancient ſovereigns of Europe accordingly had treaſures. Every Tartar chief in the preſent times is ſaid to have one.

In a commercial country abounding with every ſort of expenſive luxury, the ſovereign, in the ſame manner as almoſt all the great proprietors in his dominions, naturally ſpends a great part of his revenue in purchaſing thoſe luxuries. His own and the neighbouring countries ſupply him abundantly with all the coſtly trinkets which compoſe the ſplendid but inſignificant pageantry of a court. His ordinary expence becomes equal to his ordinary revenue, and it is well if it does not frequently exceed it. The amaſſing of treaſure can no longer be expected; and when extraordinary exigencies require extraordinary expences, he muſt neceſſarily call upon his ſubjects for an extraordinary aid. The late king of pruſſia and his father are the only great princes of Europe who, ſince the death of Henry IV. of France in 1610, are ſuppoſed to have amaſſed any conſiderable treaſure. The parſimony which leads to accumulation has become almoſt as rare in republican as in monarchical governments. The Italian republics, the United Provinces of the Netherland, are all in debt. The canton of Berne is the ſingle republic in Europe which has amaſſed any conſiderable treaſure. The other Swiſs republics have not. The taſte for ſome ſort of pageantry, for ſplendid buildings at leaſt and other public ornaments, frequently ſeems to prevail in the apparently ſober ſenate-houſe of a little republic as in the diſſipated court of the greateſt king.

The want of parſimony in time of peace impoſes the neceſſity of contracting debt in time of war. When war comes, there is no money in the treaſury but what is neceſſary for carrying on the ordinary expence of the peace eſtabliſhment. In war an eſtabliſhment of three or four times that expence becomes neceſſary for the defence of the ſtate, and conſequently a revenue three or four times greater than the peace revenue. Suppoſing that the ſovereign ſhould have, what he ſcarce ever has, the immediate means of augmenting his revenue in proportion to the augmentation of his expence; yet ſtill the produce of the taxes, from which this increaſe of revenue muſt be drawn, will not begin to come into the treaſury till perhaps ten or twelve months after they are impoſed. But the moment in which war begins, or rather the moment in which it appears likely to begin, the army muſt be augmented, the fleets muſt be fitted out, the garriſoned towns muſt be put into a poſture of defence; that army, that fleet, theſe garriſoned towns, muſt be furniſhed with arms ammunition, and proviſions. An immediate and great expence muſt be incurred in that moment of immediate danger, which will not wait for the gradual and ſlow returns of the new taxes. In this exigency government can have no other reſources but in borrowing. National.

The ſame commercial ſtate of ſociety which, by the operation of moral cauſes, brings government in this manner into the neceſſity of borrowing, produces in the ſubjects both an ability and an inclination to lend. If it commonly brings along with it the neceſſity of borrowing, it likewiſe brings along with it the facility of doing ſo.

A country abounding with merchants and manufacturers, neceſſarily abounds with a ſet of people thro' whoſe hands not only their own capitals, but the capitals of all thoſe who either lend them money or truſt them with goods, paſs as frequently or more frequently than the revenue of a private man, who without trade or buſineſs lives upon his income, paſſes through his hands. The revenue of ſuch a man can regularly paſs through his hands only once in a year. But the whole amount of the capital and credit of a merchant who deals in a trade of which the returns are very quick, may ſometimes paſs through his hands two, three, or four times in a year. A country abounding with merchants and manufacturers, therefore neceſſarily abounds with a ſet of people who have it at all times in their power to advance, if they chooſe to do ſo, a very large ſum of money to government. Hence the ability in the ſubjects of a commercial ſtate to lend.

The progreſs of the enormous debts which at preſent oppreſs, and will in the long run probably ruin, all the great nations of Europe has been pretty uniform. In England, after the Revolution, when new connections with Europe introduced a new ſyſtem of foreign politics, the expences of the nation, not only in ſettling the new eſtabliſhment, but in maintaining long wars, as principals, on the continent, for the ſecurity of the Dutch barrier, reducing the French monarchy, ſettling the Spaniſh ſucceſſion, ſupporting the houſe of Auſtria, maintaining the liberties of the Germanic body, and other purpoſes, increaſed to an unuſual degree; inſomuch that it was not thought adviſable to raiſe all the expences of any one year by taxes to be levied within that year, leſt the unaccuſtomed weight of them ſhould create murmurs among the people. It was therefore the policy of the times to anticipate the revenues of their poſterity, by borrowing immenſe Blackſt. Comment.

ſums for the current ſervice of the ſtate, and to lay no more taxes upon the ſubject than would ſuffice to pay the annual intereſt of the ſums ſo borrowed, by this means converting the principal debt into a new ſpecies of property, transferrable from one man to another at any time and in any quantity. This ſyſtem indeed ſeems to have had its original in the ſtate of Florence, A. D. 1344; which government then owed about L. 60,000 Sterling; and being unable to pay it, formed the principal into an aggregate ſum, called metaphorically a *mount* or *bank*, the ſhares whereof were transferable like our ſtocks, with intereſt at 5 *per cent.* the prices varying according to the exigencies of the ſtate. This laid the foundation of what is called the *national debt:* for a few long annuities created in the reign of Charles II. will hardly deſerve that name.

Nations, like private men, have generally begun to borrow upon what may be called *perſonal credit*, without aſſigning or mortgaging any particular fund for the payment of the debt; and when this reſource has failed them, they have gone on to borrow upon aſſignments or mortgages of particular funds.

What is called the *unfunded debt of Great Britain*, is contracted in the former of thoſe two ways. It conſiſts partly in a debt which bears, or is ſuppoſed to bear, no intereſt, and which reſembles the debts that a private man contracts upon account; and partly in a debt which bears intereſt, and which reſembles what a private man contracts upon his bill or promiſſory note. The debts which are due either for extraordinary ſervices, or for ſervices either not provided for or not paid at the time when they are performed; part of the extraordinaries of the army, navy, and ordnance, the arrears of ſubſidies to foreign princes, thoſe of ſeamens wages, &c. uſually conſtitute a debt of the firſt kind. Navy and exchequer bills, which are iſſued ſometimes in payment of a part of ſuch debts, and ſometimes for other purpoſes, conſtitute a debt of the ſecond kind; exchequer bills bearing intereſt from the day on which they are iſſued, and navy bills ſix months after they are iſſued. The bank of England, either by voluntarily diſcounting thoſe bills at their current value, or by agreeing with government for certain conſiderations to circulate exchequer bills, that is, to receive them at par, paying the intereſt which happens to be due upon them, keeps up their value, and facilitates their circulation, and thereby frequently enables government to contract a very large debt of this kind. During the great recoinage in King William's time, when the bank of England thought proper to put a ſtop to its uſual tranſactions, exchequer bills and tallies are ſaid to have ſold from 25 to 60 *per cent* diſcount; owing partly, no doubt, to the ſuppoſed inſtability of the new government eſtabliſhed by the Revolution, but partly too to the want of the ſupport of the bank of England.

When this reſource is exhauſted, and it becomes neceſſary, in order to raiſe money, to aſſign or mortgage ſome particular branch of the public revenue for the payment of the debt, government has upon different occaſions done this in two different ways. Sometimes it has made this aſſignment or mortgage for a ſhort period of time only, a year or a few years, for example; and ſometimes for perpetuity. In the one caſe, the fund was ſuppoſed ſufficient to pay within the limited time both principal and intereſt of the money borrowed: In the other, it was ſuppoſed ſufficient to pay the intereſt only, or a perpetual annuity equivalent to the intereſt; government being at liberty to redeem at any time this annuity upon paying back the principal ſum borrowd. When money was raiſed in the one way, it was ſaid to be raiſed *by anticipation;* when in the other, *by perpetual funding*, or, more ſhortly, *by funding*.

In the reign of King William, when the debt began to be amaſſed, and during a great part of that of Queen Anne, before we had become ſo familiar as we are now with the practice of perpetual funding, the greater part of the new taxes were impoſed but for a ſhort period of time (for four, five, ſix, or ſeven years only), and a great part of the grants of every year conſiſted in loans upon anticipation of the produce of thoſe taxes. The produce being frequently inſufficient for paying within the limited term the principal and intereſt of the money borrowed, deficiencies aroſe; to make good which it became neceſſary to prolong the term.

On the 31ſt of December 1697, the funded and unfunded debts amounted to L. 21,515,742 : 13 : $8\frac{1}{2}$; at the ſame time, in 1714, they were L. 53,681,076, 5s. $6\frac{1}{12}$d. In 1755, before the breaking ont of the war, they amounted to L. 72,289,673; and on the 5th of January 1763, at the concluſion of the peace, they had accumulated to L. 122,603,336 : 8 : $2\frac{1}{4}$ of funded debt, and of unfunded L. 13,027,589 : 2 : 2 more. In 1775, they were nearly 130 millions; and the laſt American war added upwards of 120 millions more to that enormous ſum: to pay the intereſt of which, and the charges of management, amounting annually to nearly eight millions and an half, the extraordinary revenues elſewhere enumerated † (excepting only the land-tax and annual malt-tax) are in the firſt place mortgaged and made perpetual by parliament. Perpetual we ſay; but ſtill redeemable by the ſame authority that impoſed them; which, if it at any time can pay off the capital, will aboliſh thoſe taxes which are raiſed to diſcharge the intereſt.

By this means, then, the quantity of property in the kingdom is greatly increaſed in idea compared with former times; yet, if we cooly conſider it, not at all increaſed in reality. We may boaſt of large fortunes, and quantities of money in the funds. But where does this money exiſt? It exiſts only in name, in paper, in public faith, in parliamentary ſecurity: and that is undoubtedly ſufficient for the creditors of the public to rely on. But then what is the pledge which the public faith has pawned for the ſecurity of theſe debts? The land, the trade, and the perſonal induſtry of the ſubject; from which the money muſt ariſe that ſupplies the ſeveral taxes. In theſe therefore, and theſe only, the property of the public creditors does really and intrinſically exiſt; and of courſe the land, the trade, and the perſonal induſtry of individuals, are diminiſhed in their true value juſt ſo much as they are pledged to anſwer. If A's income amounts to L. 100 *per annum;* and he is ſo far indebted to B, that he pays him L. 50 *per annum* for his intereſt; one half of the value of A's property is transferred to B the creditor. The creditor's property exiſts in the demand which he has upon the debtor, and no where elſe; and the debtor is only a truſtee to his creditor for one half

† See Revenue.

of the value of his income. In ſhort, the property of a creditor of the public conſiſts in a certain portion of the national taxes; by how much therefore he is the richer, by ſo much the nation, which pays theſe taxes, is the poorer.

The only advantage that can reſult to a nation from public debts, is the increaſe of circulation, by multiplying the caſh of the kingdom, and creating a new ſpecies of currency, aſſignable at any time and in any quantity; always therefore ready to be employed in any beneficial undertaking, by means of this its tranſferrable quality; and yet producing ſome profit even when it lies idle and unemployed. A certain proportion of debt ſeems to be highly uſeful to a trading people; but what that proportion is, it is not for us to determine. This much is indiſputably certain, that the preſent magnitude of our national incumbrances very far exceeds all calculations of commercial benefit, and is productive of the greateſt inconveniences. For, firſt, the enormous taxes that are raiſed upon the neceſſaries of life for the payment of the intereſt of this debt, are a hurt both to trade and manufactures, by raiſing the price as well of the artificer's ſubſiſtence as of the raw material, and of courſe in a much greater proportion, the price of the commodity itſelf. Nay, the very increaſe of paper-circulation itſelf, when extended beyond what is requiſite for commerce or foreign exchange, has a natural tendency to increaſe the price of proviſions as well as of all other merchandiſe. For as its effect is to multiply the caſh of the kingdom, and this to ſuch an extent that much muſt remain unemployed, that caſh (which is the univerſal meaſure of the reſpective values of all other commodities) muſt neceſſarily ſink in its own value, and every thing grow comparatively dearer. Secondly, if part of this debt be owing to foreigners, either they draw out of the kingdom annually a conſiderable quantity of ſpecie for the intereſt; or elſe it is made an argument to grant them unreaſonable privileges in order to induce them to reſide here. Thirdly, if the whole be owing to ſubjects only, it is then charging the active and induſtrious ſubject, who pays his ſhare of the taxes to maintain the indolent and idle creditor who receives them. Laſtly, and principally, it weakens the internal ſtrength of a ſtate, by anticipating thoſe reſources which ſhould be reſerved to defend it in caſe of neceſſity. The intereſt we now pay for our debts would undoubtedly be ſufficient to maintain the moſt vigorous war that any national motives could poſſibly require. If indeed our anceſtors in King William's time had annually paid, ſo long as their exigencies laſted, a far leſs ſum than we now annually raiſe upon their accounts, they would not in time of war have borne ſo great burdens as they have bequeathed to and ſettled upon their poſterity in time of peace; and might have been eaſed the inſtant the exigence was over. See Funds.

On the whole, then, the national debt is undoubtedly a ſubject of vaſt importance, and as ſuch it has been always conſidered; for much has been ſaid and written upon it, and many ſchemes have been propoſed at various times and by various perſons for gradually removing it, it being conſidered by the moſt judicious as a moſt pernicious incumbrance to a commercial country. Some we are aware, think it of vaſt utility; but this opinion is too eccentric, and in our eſtimation too feebly ſupported to be convincing. The public debt is indiſputably a great grievance; and every lover of his country muſt ſurely wiſh to ſee it removed: the period, however, when this bleſſing ſhall take place, if indeed it ever arrive, muſt at leaſt be very diſtant.

It is neither our buſineſs nor intention (even if the limits preſcribed to the article did not prevent it) to be minute on the ſubject, or to propoſe any ſchemes for alleviating the burdens of the nation. That indeed has been already done by far abler hands than we profeſs to be; we muſt therefore refer ſuch as wiſh for farther information on this intereſting topic to thoſe (and they are not a few) who have treated of it at full length. Smith's Wealth of Nations, and Sir John Sinclair's Hiſtory of the Revenue, go to the bottom of the matter. The writings of Dr Price likewiſe deſerve conſiderable attention, eſpecially as one of his plans for the reduction of the debt has in fact been adopted, and in conſequence eſtabliſhed, by the legiſlature: His three plans may be found in a late pamphlet by William Morgan, intitled, A Review of Dr Price's Writings on the Subject of the Finances of this Kingdom.

NATIVITY, or Natal day, the day of a perſon's birth. The word *nativity* is chiefly uſed in ſpeaking of the ſaints; as, the nativity of St John the Baptiſt, &c. But when we ſay *the* Nativity, it is underſtood of that of Jeſus Chriſt, or the feaſt of Chriſtmas.

Nativity, *nativitas*, in ancient law-books, ſignifies bondage or ſervitude.

Nativity, in aſtrology, the theme or figure of the heavens, and particularly of the twelve houſes, at the moment when a perſon was born; called alſo the *horoſcope*.

Caſting the nativity, or by calculation ſeeking to know how long the queen ſhould live, &c. was made felony, an. 23 Eliz. c. 2.

NATIVO habendo, in law, a writ directed to the ſheriff, for a lord who claimed inheritance in any villain, when a villain was run away from him, for the apprehending and reſtoring him to the lord.

NATIX, in natural hiſtory, a name given by ſome old writers to the *nerita*.

NATOLIA, the modern name of the Leſſer Aſia, being the moſt weſterly part of Turkey in Aſia, and conſiſting of a large peninſula which extends from the river Euphrates as far as the Archipelago, the ſeas of Marmora, the ſtraits of Galipoli and of Conſtantinople, which ſeparate it from Europe on the weſt. It is bounded on the north by the Black ſea, and on the ſouth by the Mediterranean.

NATRIX, in botany, the name given by Rivinius to a genus of plants nearly allied to the anonis, and comprehended with it in one genus by Linnæus, under the name of anonis. See *Rest-harrow*

Natrix, in zoology, the name of the common or water-ſnake, called alſo *torquata*, from the ring about its neck. It is not a water animal, properly ſpeaking, but a land one, which being able to ſwim very well, often takes the water to hunt about for frogs, which are its principal food. It grows to be much longer and larger than the viper, and does not bring forth live young ones, but great numbers of eggs, which it lays in dunghills to be hatched by the warmth of the place, or by the heat of the ſun.

NATRUM, the nitre of the ancients, in natural hiſtory, is a genuine, pure and native ſalt, extremely different from our nitre, and indeed from all the other native ſalts, it being a fixed alkali, plainly of the nature of thoſe made by fire from vegetables, yet capable of a regular cryſtallization, which thoſe ſalts are not. It is found on the ſurface of the earth, or at very ſmall depths within it; and is naturally formed into thin and flat cakes or cruſts, which are of a ſpungy or cavernous ſubſtance, very light and friable, and, when pure, of a pale browniſh white; but as its ſpungy texture renders it very ſubject to be fouled by earth received into its pores, it is often met with of a deep dirty brown, and not unfrequently reddiſh.

Natrum, whether native or purified, diſſolves in a very ſmall quantity of water; and this ſolution is, in many parts of Aſia, uſed for waſhing; where it is alſo made into ſoap, by mixing it with oil. Natrum reduced to powder, and mixed with ſand or flints, or with any other ſtone of which cryſtal is the baſis, makes them readily run into glaſs. Gold heated red-hot, and ſprinkled with a ſmall quantity of this ſalt, melts in the ſame manner; as does alſo iron, copper, and the regulus of antimony: which melt much more eaſily than they otherwiſe would do. Mercury cannot be mixed with it by any art, and indeed will not amalgamate with metals if only a little of this ſalt be added. It is found in great abundance in many parts of Aſia, where the natives ſweep it up from the ſurface of the ground, and call it *ſoap-earth*. The earlieſt account we have of it is in the ſcriptures, where we find that the ſalt called *nitre* in thoſe times would ferment with vinegar, and had an abſterſive quality, ſo that it was uſed in baths and in waſhing things. Solomon compares the ſinging of ſongs with a heavy heart, to the contrariety of vinegar and nitre; and Jeremiah ſays, that if the ſinner waſh himſelf with nitre, his ſin is not cleanſed off. Theſe are properties that perfectly agree with this ſalt, but not at all with our ſaltpetre.

NATTER-JACK, in zoology, a ſpecies of RANA.

NATURAL, in general, ſomething that relates to nature. See NATURE.

NATURAL Children, are thoſe born out of lawful wedlock. See BASTARD.

NATURAL Functions, are thoſe actions whereby the aliments are changed and aſſimilated ſo as to become a part of the body.

NATURAL, in heraldry, is uſed where animals, fruits, flowers, &c. are blazoned with the colours they naturally have, though different from the common colours of heraldry: and this is to prevent their armories being accuſed of falſity, when blazoned with the names of colours unknown in heraldry.

NATURAL Note, in muſic, is uſed in oppoſition to flat and ſharp notes, which are call *artificial notes*. See NOTE, SCALE, &c.

NATURAL is alſo uſed for ſomething coming immediately out of the hands of nature: in which ſenſe it ſtands oppoſed to *factitious* or artificial, which ſignifies ſomething wrought by art. See ARTIFICIAL.

Biſhop Wilkins obſerves, that there appears a world of difference between natural and [illegible] when viewed with microſcopes. The [illegible] adorned with all imaginable elegance [illegible] latter, though the moſt curious [illegible] rude and unhewn; the moſt [illegible] bar of iron; and the moſt accurate [illegible] boſſment, as if done with a mattock or a [illegible]

NATURAL Beauty, or the beauty of natural objects, is that quality or thoſe qualities in the works of nature, or more properly of God, which are calculated to excite pleaſing ſenſations in the mind of ſuch perſons of true taſte as attentively obſerve them. It will not, we truſt, be deemed improper or impertinent, therefore, to introduce a few obſervations on this ſubject, previous to our treating of natural hiſtory.—To many, it is hoped, it will appear to be a very proper introduction to that important article. "That ſenſibility to beauty, which when cultivated and improved, we term taſte, is univerſally diffuſed through the human ſpecies†; and it is moſt uniform with reſpect to thoſe objects, which being out of our power are not liable to variation from accident, caprice, or faſhion. The verdant lawn, the ſhady grove, the variegated landſcape, the boundleſs ocean, and the ſtarry firmament, are contemplated with pleaſure by every attentive beholder. But the emotions of different ſpectators, though ſimilar in kind, differ widely in degree; and to reliſh with full delight the enchanting ſcenes of nature, the mind muſt be uncorrupted by avarice, ſenſuality, or ambition; quick in her ſenſibilities; elevated in her ſentiments; and devout in her affections. He who poſſeſſes ſuch exalted powers of perception and enjoyment, may almoſt ſay, with the poet,

† Dr Percival's Moral and Literary Diſſertations.

I care not, Fortune! what you me deny;
You cannot rob me of free Nature's grace;
You cannot ſhut the windows of the ſky,
Through which Aurora ſhows her bright'ning face;
You cannot bar my conſtant feet to trace
The woods and lawns, by living ſtream, at eve:
Let health my nerves and finer fibres brace,
And I their toys to the great children leave:
Of fancy, reaſon, virtue, naught can me bereave.

"Perhaps ſuch ardent enthuſiaſm may not be compatible with the neceſſary toils and active offices which Providence has aſſigned to the generality of men. But there are none to whom ſome portion of it may not prove advantageous; and if it were cheriſhed by each individual, in that degree which is conſiſtent with the indiſpenſable duties of his ſtation, the felicity of human life would be conſiderably augmented. From this ſource, the refined and vivid pleaſures of the imagination are almoſt entirely derived: and the elegant arts owe their choiceſt beauties to a taſte for the contemplation of nature. Painting and ſculpture are expreſs imitations of viſible objects; and where would be the charms of poetry, if diveſted of the imagery and embelliſhments which ſhe borrows from rural ſcenes? Painters, ſtatuaries, and poets, therefore, are always ambitious to acknowledge themſelves the pupils of nature! and as their ſkill increaſes, they grow more and more delighted with every view of the animal and vegetable world. But the pleaſure reſulting from admiration is tranſient; and to cultivate taſte, without

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regard to its influence on the paſſions and affection, 'to cultivate the fair its bloſſoms, which is capable of yielding the richeſt and moſt valuable fruit.' Phyſical and moral beauty bear ſo intimate a relation to each other, that they may be conſidered as different gradations in the ſcale of excellence; and the knowledge and reliſh of the former ſhould be deemed only a ſtep to the nobler and more permanent enjoyments of the latter.

"Whoever has viſited the Leaſowes, in Warwickſhire, muſt have felt the force and propriety of an inſcription which meets the eye at the entrance into thoſe delightful grounds.

Would you then taſte the tranquil ſcene?
Be ſure your boſoms be ſerene:
Devoid of hate, devoid of ſtrife,
Devoid of all that poiſons life:
And much it 'vails you, in their place,
To graft the love of human race.

"Now ſuch ſcenes contribute powerfully to inſpire that ſerenity which is neceſſary to enjoy and to heighten their beauties. By a ſecret contagion, the ſoul catches the harmony which he contemplates; and the frame within aſſimilates itſelf to that which is without. For,

Who can forbear to ſmile with Nature? Can
The ſtormy paſſions in the boſom roll,
While every gale is peace, and every grove
Is melody?

"In this ſtate of ſweet compoſure, we become ſuſceptible of virtuous impreſſions, from almoſt every ſurrounding object. The patient ox is viewed with generous complacency; the guileleſs ſheep with pity; and the playful lamb raiſes emotions of tenderneſs and love. We rejoice with the horſe, in his liberty and exemption from toil, while he ranges at large through enamelled paſtures; and the frolics of the colt would afford unmixed delight, did we not recollect the bondage which he is ſoon to undergo. We are charmed with the ſongs of birds, ſoothed with the buz of inſects, and pleaſed with the ſportive motions of fiſhes, becauſe theſe are expreſſions of enjoyment; and we exult in the felicity of the whole animated creation. Thus an equal and extenſive benevolence is called forth into exertion; and having felt a common intereſt in the gratifications of inferior beings, we ſhall be no longer indifferent to their ſufferings, or became wantonly inſtrumental in producing them.

"It ſeems to be the intention of Providence, that the lower order of animals ſhould be ſubſervient to the neceſſities, convenience, and nutriment of man. But his right of dominion extends no farther; and if this right be exerciſed with mildneſs, humanity, and juſtice, the ſubjects of his power will be no leſs benefited than himſelf. For various ſpecies of living creatures are annually multiplied by human art, improved in their perceptive powers by human culture, and plentifully fed by human induſtry. The relation, therefore, is reciprocal between ſuch animals and man: and he may ſupply his own wants by the uſe of their labour, the produce of their bodies, and even the ſacrifice of their lives, whilſt he co-operates with all-gracious heaven in promoting happineſs, the great end of creation.

"But though it be true, that partial evil, with reſpect to different orders of ſenſitive beings, may be univerſal good; and that it is a wiſe and benevolent inſtitution of nature, to make deſtruction itſelf, within certain limitations, the cauſe of an increaſe of life and enjoyment: yet a generous perſon will naturally extend his compaſſionate regards to every individual that ſuffers for his ſake; and, whilſt he ſighs

Even for the kid or lamb that parts its life
Beneath the bloody knife,

he will naturally be ſolicitous to mitigate pain, both in duration and degree, by the gentleſt means of inflicting it.

"We are inclined to believe however, that this ſenſe of humanity would ſoon be obliterated, and that the heart would grow callous to every ſoft impreſſion, were it not for the benignant influence of the ſmiling face of nature. The count de Lauzun, when impriſoned by Louis XIV. in the caſtle of Pignerol, amuſed himſelf, during a long period of time with catching flies, and delivering them to be devoured by a rapacious ſpider. Such an entertainment was equally ſingular and cruel, and inconſiſtent, we believe, with his natural character, and his ſubſequent turn of mind. But his cell had no window, and received only a glimmering light from an aperture in the roof. In leſs unfavourable circumſtances, may we not preſume, that inſtead of ſporting with miſery, he would have releaſed the agoniſing flies, and bid them enjoy that freedom of which he himſelf was breaved?

"But the taſte for natural beauty is ſubſervient to higher purpoſes than thoſe which have been enumerated: and the cultivation of it not only refines and humaniſes but dignifies and exalts the affections. It elevates them to the admiration and love of that Being who is the author of all that is fair, ſublime, and good in the creation. Scepticiſm and irreligion are hardly compatible with the ſenſibility of heart which ariſes from a juſt and lively reliſh of the wiſdom, harmony, and order ſubſiſting in the world around us: and emotions of piety muſt ſpring up ſpontaneouſly in the boſom that is in uniſon with all animated nature. Actuated by this divine inſpiration, man finds a fane in every grove: and, glowing with devout fervour, he joins his ſong to the univerſal chorus, or muſes the praiſe of the Almighty, in more expreſſive ſilence. Thus they

Whom Nature's works can charm, with God himſelf
Hold converſe; grow familiar, day by day,
With his conceptions; act upon his plan;
And form to his the reliſh of their ſouls."

On the whole then, it certainly appears, that the advantages reſulting from a taſte for natural beauties are great and important: it is equally certain, that as it is uſeful, ſo it is a continual ſource of real enjoyment; for a more rational pleaſure cannot poſſibly occupy the attention or captivate the affections of mankind, than that which ariſes from a due conſideration of the works of nature. Pleaſure, we know, is a neceſſary ingredient in human life, in order in ſome meaſure to counterbalance the pains, the evils, and liſtleſsneſſes, which are at times perhaps unavoidable, and in order to render life tolerable. It is the part then of

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the moraliſt, and it has been frequently his buſineſs, to point out and recommend ſuch pleaſures as are highly gratifying, and are yet perfectly innocent. The Spectator, whoſe works will be admired as long as the language in which they are written is underſtood, recommend ſtrongly and elegantly the pleaſures of a garden; and a later writer*, of no common degree of merit, and of a very conſiderable fame, has an eſſay on the ſame ſubject, from which we ſhall ſelect a few obſervations, and ſo conclude the article. "Not he alone (ſays this elegant writer) is to be eſteemed a benefactor to mankind, who makes an uſeful diſcovery; but he alſo who can point out and recommend an innocent pleaſure. Of this kind are the pleaſures ariſing from the obſervation of nature; and they are highly agreeable to every taſte uncorrupted by vicious indulgence. Rural ſcenes of almoſt every kind are delightful to the mind of man. But the misfortune is, that the greater part are hurried on in the career of life with too great rapidity to be able to give attention to that which ſolicits no paſſion. The darkeſt habitation in the dirtieſt ſtreet of the metropolis, where money can be earned, has greater charms with many than the groves of Hagley.

"The patron of refined pleaſure, the elegant Epicurus, fixed the ſeat of his enjoyment in a garden. He was of opinion, that a tranquil ſpot, furniſhed with the united ſweets of art and nature, was the beſt adapted to delicate repoſe. And even the ſeverer philoſophers of antiquity were wont to diſcourſe in the ſhade of a ſpreading tree, in ſome cultivated plantation. It is clear, on intuition, that nature [illegible] intended [illegible] productions. She [illegible] [illegible] She has clothed the garden [illegible] of various [illegible] a pleaſing viciſſitude. The [illegible] exhibit in the ſpring, the various ſhades which they aſſume in ſummer, the yellow and [illegible] tinge of autumn, and the nakedneſs of winter, afford a conſtant pleaſure to a lively imagination. From the [illegible] to the moſs-roſe, the flower garden diſplays an infinite variety of ſhape and colour. The taſte of the floriſt has been ridiculed as trifling; yet ſurely [illegible] reaſon. Did nature bring forth the tulip and the lily, the roſe and the honeyſuckle, to be neglected by the haughty pretender to ſuperior reaſon? To omit a ſingle ſocial duty for the cultivation of a polyanthus were ridiculous as well as criminal; but to paſs by the beauties laviſhed before us, without obſerving them, is no leſs ingratitude than ſtupidity. A bad heart finds little amuſement but in a communication with the active world, where ſcope is given for the indulgence of malignant paſſions; but an amiable diſpoſition is commonly known by a taſte for the beauties of the animal and the vegetable creation." In ſhort, ſince the world was made for our uſe, ſince the beauties of nature are alike diſplayed before all men, and ſince they are unqueſtionably an inexhauſtible fund of innocent amuſement; that ſubject muſt be of vaſt importance which enables us to reliſh them properly.

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* Dr Knox.

NATURAL HISTORY.

NATURAL HISTORY, in its moſt extenſive ſignification, denotes a knowledge and deſcription of the whole univerſe. Matters of fact reſpecting the heavens, meteors, the atmoſphere, the earth, reſpecting all the phenomena, indeed, which occur in the world, and even of the external parts and actions of man himſelf, as far as reaſon can diſcover them, belong to the province of natural hiſtory; but when we leave the ſimple recital of effects, and endeavour to inveſtigate the cauſes of ſuch and ſuch phenomena, we then leave natural hiſtory, and enter on philoſophy. The object of our article, therefore, in the ſenſe we have here given it, is as extenſive as nature itſelf. But, in its more appropriated ſenſe, it is well known that its province only extends to the ſurface of the earth, the works on it, and the inhabitants of it. It treats of thoſe ſubſtances of which, as far as our reſearches have led us, the earth is compoſed, and of thoſe organized bodies, whether vegetable or animal, which adorn its ſurface, which riſe into the air, or live in the boſom of the waters.—But as a ſcience ſo various and comprehenſive could neither with propriety nor advantage be completely diſcuſſed under the general title, we have to refer the reader to the article KINGDOMS *(in Natural Hiſtory)*, where he will be directed to the different articles which conſtitute either the branches or the objects of the ſcience, and which are all treated under their reſpective names. In the preſent article it is propoſed to give a general and philoſophical view of the ſubject: To ſet forth, in a ſummary way, whatever curious, worthy to be known, or not obvious to every obſerver, occurs in the three kingdoms of nature: with their conſtitution, laws, and œconomy: or, in other words, that all-wiſe diſpoſition of the Creator in relation to natural things, by which they are fitted to produce general ends and reciprocal uſes.

SECT. I. *Of the Terraqueous Globe in general, and its Strata.*

THE world, or the terraqueous globe which we inhabit, is every where ſurrounded with the elements, and contains in its ſuperficies the three *Kingdoms of Nature*, as they are called: the foſſils, which conſtitute the cruſt of the earth; the vegetables, which adorn the ſurface of it, and draw the greateſt part of their nouriſhment from the foſſil kingdom; and the animal kingdom, which is ſuſtained by the vegetable kingdom. Thus, then, theſe three grand diviſions, or, as they are commonly called, kingdoms; cover, adorn, and vary the ſurface of the earth.

As to the STRATA of the terraqueous globe, [illegible] as far as we have hitherto been able to diſcover, the upper parts conſiſt of rag-ſtone; the next of ſlate; the third of marble filled with petrifactions; the fourth again, of ſlate; and laſtly, the loweſt of free-ſtone ——

Of the Terraqueous Globe.

The habitable part of the earth, though it is ſcooped into various inequalities, yet is every-where high in compariſon with the water; and the farther it is from the ſea it is generally higher. Thus the waters in the lower places are not at reſt, unleſs ſome obſtacle confines them, and by that means form lakes and marſhes.

The ſea ſurrounds the continent, and takes up the greateſt part of the earth's ſurface, as geographers inform us. Nay, that it once ſpread over much the greateſt part, we may be convinced by its yearly decreaſe, by the rubbiſh left by the tides, by ſhells, ſtrata, and other circumſtances.

The ſea-ſhores are uſually full of dead teſtacious animals, wreck, and ſuch like bodies, which are yearly thrown out of the ſea. They are alſo covered with ſand of various kinds, ſtones, &c. It happens, moreover, that while the more rapid rivers ruſh through narrow valleys, they wear away the ſides; and thus the friable and ſoft earth falls in, and its ruins are carried to diſtant and winding ſhores; whence it is certain, that the continent gains no ſmall increaſe, as the ſea ſubſides.

The CLOUDS collected from exhalations, chiefly from the ſea, but likewiſe from other waters, and moiſt grounds, and condenſed in the lower regions of the ATMOSPHERE, ſupply the earth with RAIN; but ſince they are attracted by the mountainous parts of the earth, it neceſſarily follows, that thoſe parts muſt have, as is fit, a larger ſhare of water than the reſt. SPRINGS, which generally ruſh out at the foot of mountains, take their riſe from this very rain-water, and vapours condenſed, that trickle through the holes and interſtices of looſe bodies, and are received into caverns.

Theſe afford a pure WATER purged by ſtraining: and rarely dry up in ſummer, or freeze in winter, ſo that animals never want a wholeſome and refreſhing liquor.

The chief ſources of RIVERS are fountains and rills growing by gradual ſupplies into ſtill larger and larger ſtreams: till at laſt, after the conflux of a vaſt number of them, they find no ſtop, but falling into the ſea with much rapidity, they there depoſit the united ſtores they have gathered, along with foreign matter, and ſuch earthy ſubſtances as they tore off in their way. Thus the water returns in a circle whence it firſt drew its origin, that it may act over the ſame ſcene in continued ſucceſſion.

Marſhes ariſing from water retained in low grounds, are filled with moſſy tumps, which are brought down by the water from the higher parts, or are produced by putrefied plants.

We often ſee new meadows ariſe from marſhes dried up. This happens ſooner when the *ſphagnum* (a kind of moſs) has laid a foundation; for this in proceſs of time changes into a very porous mould, till almoſt the whole marſh is filled with it. After that the ruſh ſtrikes root, and along with the cotton-graſſes conſtitutes a turf, raiſed in ſuch a manner that the roots get continually higher, and thus lay a more firm foundation for other plants, till the whole marſh is changed into a fine and delightful meadow; eſpecially if the water happens to work itſelf a new paſſage.

Hillocks, that abound in low grounds, occaſion the earth to increaſe yearly, more than the countryman would wiſh, and ſeem to do hurt: but in this the great induſtry of nature deſerves to be taken notice of. For by this means the barren ſpots become ſooner rich meadow and paſture land. Theſe hillocks are formed by the ant, by ſtones and roots, and the trampling of cattle: but the principal cauſe is the force of the winter-cold, which in the ſpring raiſes the roots of plants ſo high above the ground, that being expoſed to the air, they grow, and periſh; after which the golden maidenhairs fill the vacant places.

Of the Terraqueous Globe.

Mountains, hills, valleys, and all the inequalities of the earth, though ſome think they take away much from its beauty, are ſo far from producing ſuch an effect, that on the contrary they give a more pleaſing aſpect, and confer great advantages. For thus the terreſtrial ſuperficies is larger; different kinds of plants thrive better, and are more eaſily watered; and the rain-waters run in continual ſtreams into the ſea; not to mention many other uſes in relation to winds, heat, and cold. Alps are the higheſt mountains, that reach to the ſecond region of the air, where trees cannot grow erect. The higher theſe Alps are, the colder they are *cæteris paribus*. Hence the Alps in Sweden, Siberia, Swiſſerland, Peru, Braſil, Armenia, Aſia, Africa, are perpetually covered with ſnow, which becomes almoſt as hard as ice. But if by chance the ſummer heats be greater than ordinary, ſome part of theſe ſtores melts, and runs through rivers into the lower regions, which by this means are much refreſhed.

It is ſcarcely to be doubted, but that the rocks and ſtones diſperſed over the globe were formed originally in, and from, the earth; but when torrents of rain have ſoftened, as they eaſily do, the ſoluble earth, and carried it down into the lower parts, we imagine it happens, that theſe ſolid and heavy bodies, being laid bare, ſtick out above the ſurface. We might alſo take notice of the wonderful effect of the tide, ſuch as we ſee happen from time to time on the ſea-ſhore, which being daily and nightly aſſaulted with repeated blows, at length gives way, and breaks off. Hence we ſee in moſt places the rubbiſh of the ſea, and ſhores.

The winter by its froſt prepares the earth and mould, which thence are broken into very minute particles, and thus, being put into a mouldering ſtate, become more fit for the nouriſhment of plants; nay, by its ſnow it covers the ſeeds and roots of plants, and thus by *cold* defends them from the *force of cold*. We muſt add alſo, that the piercing froſt of the winter purifies the atmoſphere and putrid waters, and makes them more wholeſome for animals.

The perpetual ſucceſſion of heat and cold with us renders the ſummers more pleaſing: and tho' the winter deprives us of many plants and animals, yet the perpetual ſummer within the tropics is not much more agreeable, as it often deſtroys men and other animals by its immoderate heat; though it muſt be confeſſed, that thoſe regions abound with exquiſite fruits. Our winters though very troubleſome to a great part of the globe on account of their vehement and intenſe cold, yet are leſs hurtful to the inhabitants of the northern parts, as experience teſtifies. Hence it hap-

pens,

Of the Seaſons.

pens, that we may live very conveniently on every part of the earth, as every different country has different advantages from nature.

The ſeaſons, like every thing elſe, have their viciſſitudes; their beginnings, their progreſs, and their end.

The age of man begins from the cradle; pleaſing childhood ſucceeds; then active, youth; afterwards manhood, firm, ſevere, and intent upon ſelf preſervation; laſtly, old age creeps on, debilitates, and at length totally deſtroys our tottering bodies.

The ſeaſons of the year proceed in the ſame way. Spring, the jovial, playful infancy of all living creatures, repreſents childhood and youth; for then plants ſpread forth their luxuriant flowers, fiſhes exult, birds ſing, every part of nature is intent upon generation. The ſummer, like middle age, exhibits plants, and trees every where cloathed with green; it gives vigour, to animals, and plumps them up; fruits then ripen, meadows look cheerful, every thing is full of life. On the contrary, autumn is gloomy; for then the leaves of trees begin to fall, plants to wither, inſects to grow torpid, and many animals to retire to their winter-quarters.

The day proceeds with juſt ſuch ſteps as the year. The morning makes every thing alert, and fit for buſineſs; the ſun pours forth his ruddy rays; the flowers, which had as it were ſlept all night, awake and expand themſelves again; the birds with their ſonorous voices and various notes make the woods ring, meet together in flocks, and ſacrifice to Venus. Noon tempts animals into the fields and paſtures; the heat puts them upon indulging their eaſe, and even neceſſity obliges them to it. Evening follows, and makes every thing more ſluggiſh; flowers ſhut up*, and animals retire to their lurking places. Thus the ſpring, the morning, and youth are proper for generation; the ſummer, noon, and manhood, are proper for preſervation; and autumn, evening, and old age, are not unfitly likened to deſtruction.

* See Vigil's of Plants.

In order to perpetuate the eſtabliſhed courſe of nature in a continued ſeries, the Divine Wiſdom has thought fit that all living creatures ſhould conſtantly be employed in *producing* individuals: that all natural things ſhould contribute and lend a helping hand towards *preſerving* every ſpecies: and laſtly, that the *death* and *deſtruction* of one thing ſhould always be ſubſervient to the production of another. Hence the objects of our preſent inquiry fall to be conſidered in a threefold view, that of *propagation*, *preſervation*, and *death* or *deſtruction*.

Sect. II. *The Foſſil Kingdom.*

I. Propagation.

It is agreed on all hands, that ſtones are not organical bodies, like plants and animals; and therefore it is as clear that they are not produced from an egg, like the tribes of the other kingdoms. Hence the variety of foſſils is proportionate to the different combinations of coaleſcent particles; and hence the ſpecies in the foſſil kingdom are not ſo diſtinct as in the other two. Hence alſo the laws of generation in relation to foſſils have been in all ages extremely difficult to explain; and laſtly, hence have riſen ſo many different opinions about them, that it would be endleſs to enumerate them all. We therefore, for the preſent, ſhall content ourſelves with giving a very few obſervations on this ſubject.

Foſſil Kingdom.

Some people ſuppoſe that clay is the ſediment of the ſea; and obſervation ſo far ſeems to go along with this opinion, for great plenty of it is generally found along the coaſts. Seamen who have been ſo accurate as to keep journals, have obſerved, that a very minute ſand covers the bottom of the ocean; and ſeem to think that it is daily cryſtallized from the water. It is now, generally acknowledged, that teſtaceous bodies and petrifactions reſembling animals were once real animals or vegetables. It has been ſuppoſed indeed, that ſhells being of a calcareous nature, changed the adjacent clay, ſand, or mould, into the ſame kind of ſubſtance. Hence it appears certain, that marbles may be generated from petrifactions; and therefore it is often full of them. Rag-ſtone, the common matter of our rocks, appears to be formed from a ſandy kind of clay; moſt frequently, however, this appears to happen where the earth is impregnated with iron. Free-ſtone ſeems to be the product of ſand: and, the deeper the bed where it is found, the more compact it becomes; and the more denſe the ſand, the more eaſily it concretes. But if an alkaline clay chances to be mixed with the ſand, the freeſtone is generated more readily, as in that called *cos friatilis particulis argillo-glarenſis*. The flint is almoſt the only kind of ſtone, certainly the moſt common, in chalky mountains.—It would appear therefore from this to be produced from chalk: but whether it can be reduced to chalk again, is left for others to enquire.

Stalactites, or drop-ſtone, is compoſed of calcareous particles, adhering to a dry, and generally a vegetable body, and is depoſited by dropping water; from which circumſtance it ſeems to have derived its vulgar name.

Incruſtrations (Syſt. Nat. 32. 5. 6. 7. 8.), are, in general, it appears, generated where a vitriolic water connects clayey and earthy particles together.

Slate, by the vegetables that are often encloſed in it ſeems to take its origin from a marſhy mould.

Metals vary according to the nature of the matrix in which they adhere; *e. g.* the pyrites cupri Fahlumenus contains frequently ſulphur, arſenic, iron, copper, a little gold, vitriol, alum, ſometimes lead ore, ſilver and zinc. Thus gold, copper, iron, zinc, arſenic, pyrites, vitriol, come out of the ſame vein. That very rich iron ore, at Normark in Vermilandia, where it was cut tranſverſely by a vein of clay, was changed into pure ſilver. The number therefore of ſpecies and varieties of foſſils, each ſerving different purpoſes according to their different natures, will be in proportion as the different kinds of earths and ſtones are variouſly combined,

II. Preservation.

As foſſils are deſtitute of life and organization, are hard, and not obnoxious to putrefaction; ſo they laſt longer than any other kind of bodies. How far the air contributes to this duration, it is eaſy to perceive; ſince air hardens many ſtones upon the ſur-

[illegible] of the earth, and become then more ſolid, compact, and able to reſiſt the injuries of time. Thus it is known from daily obſervation, that free-ſtone that has been long expoſed to the air becomes hardened. The free-ſtone which they uſe in Flanders and about Bruſſels for building, [illegible], as long as it continues in the quarry [illegible]; but when dug up and expoſed to the air it grows remarkably harder.

[illegible] we may be of the cauſe why large rocks are every where to be ſeen ſplit, whence great fragments are frequently torn off; yet we may obſerve, that fiſſures are cloſed up by water, which gets between them, and is detained there; forming cryſtal and ſpar. Hence we ſcarcely ever find any cryſtal, but in thoſe ſtones which have retained for ſome time in its chinks, water loaded with ſtony particles. In the ſame manner [illegible] the cavities in mines, and concretes into quartz or a [illegible] cryſtal.

It is manifeſt that ſtones are not only generated, augmented, and changed perpetually, from incruſtations brought upon moſs, but are alſo increaſed by cryſtal and ſpar. Not to mention that the adjacent earth, eſpecially if it be impregnated with iron particles, is commonly changed into a ſolid ſtone.

It is ſaid, that the marble quarries in Italy, from whence fragments are cut, grow up again. Ores grow by little and little, whenever the mineral particles conveyed by the means of water through the clefts of mountains, are retained there; ſo that, adhering to the homogeneous matter a long while, at laſt they take its nature, and are changed into a ſimilar ſubſtance.

III. Destruction.

Fossils, although they are the hardeſt of bodies, yet are found ſubject to the laws of deſtruction, as well as all other created ſubſtances. For they are diſſolved in various ways by the elements exerting their force upon them; as by water, air, and the ſolar rays; as alſo by the rapidity of rivers, violence of cataracts, and eddies, which continually beat upon, and at laſt reduce to powder the hardeſt rocks. The agitations of the ſea and lakes, and the vehemence of the waves, excited by turbulent winds, pulveriſe ſtones, as evidently appears by their roundneſs along the ſhore. Nay, as the poet ſays.

The hardeſt ſtone inſenſibly gives way
To the ſoft drops that frequent on it play.

So that we ought not to wonder that theſe very hard bodies moulder away into powder, and are obnoxious like others to the conſuming tooth of time.

Sand is formed of free-ſtone, which is deſtroyed partly by froſt, making it friable; partly by the agitation of water and waves, which eaſily wear away, diſſolve, and reduce into minute particles what the froſt had made friable.

Chalk is in general ſuppoſed to be formed of rough marble, which the air, the ſun, and the winds have diſſolved. Tho ſlate earth, or humus ſchiſti, (Syſt. Nat. 512.) owes its origin to ſlate, ſhowers, air, and ſnow melted.

Ochre is formed of metals diſſolved, and preſents the very ſame colour, which we always find the are tinged with [illegible]. [illegible] in the ſame manner [illegible] with [illegible] ſcorched(?).

The mica ſterilis ([illegible] Nat. [illegible]) [illegible] in the parts [illegible] the ſun, it diſſolves into ſand, [illegible] little upon the earth [illegible] [illegible] [illegible] there are [illegible] the [illegible] another.

Teſtaceous worms ought not to be paſſed over on this occaſion, for they eat away the hardeſt rocks. The ſpecies of ſhell-fiſh called [illegible] through ſtones in Italy, and [illegible] them ſo that the people who eat them are obliged to break the ſtones before they can come at them. The cochlea, (*Faun. Suec.* 12[illegible]), a [illegible] that lives on craggy rocks, eats and bores through the chalky hills, as worms do through wood. This is made evident by the obſervations of the celebrated de Geer. It ought to be obſerved here, that there are often found dead animals in the hearts of the hardeſt rocks, without any viſible trace of the manner of their getting there; from whence many have ſuppoſed that ſtones were originally fluid. Concerning ſuch matters, about which we have but little data, there will always be a great diverſity of opinions. It is not our buſineſs, at leaſt in this place, to give an opinion on a doubtful ſubject: the fact is ſo; of the cauſe let others judge.

Sect. III. *The Vegetable Kingdom.*

I. Propagation.

Anatomy abundantly proves, that all plants are organic and living bodies; and that all organic bodies are propagated from an egg has been ſufficiently demonſtrated by the induſtry of modern writers. We therefore the rather, according to the opinion of the ſkilful, reject the equivocal generation of plants; and the more ſo, as it is certain that every living thing is produced from an egg. Now the ſeeds of vegetables are called *eggs;* theſe are different in every different plant, that the means being the ſame, each may multiply its ſpecies, and produce an offspring like its parent. We do not deny, that very many plants puſh forth from their roots freſh offſets for two or more years. Nay, not a few plants may be propagated by branches, buds ſuckers, and leaves, fixed in the ground, as likewiſe many trees. Hence their ſtems being divided into branches, may be looked on as roots above ground for in the ſame way the roots creep under ground, and divide into branches. And there is the more reaſon for thinking ſo, becauſe we know that a tree will grow in an inverted ſituation, *viz.* the roots being placed upwards, and the head downwards, and buried in the ground; for then the branches will become roots, and the roots will produce leaves and flowers. The lime-tree will ſerve for an example, on which gardeners have chiefly made an experiment. Yet this by no means overturns the doctrine, that all vegetables are propagated by ſeeds; ſince it is clear, that in each of the foregoing inſtances nothing vegetates but what was

Vegetable Kingdom

was the part of a plant, formerly produced from ſeeds; ſo that accurately ſpeaking, without ſeed no new plant is produced.

Thus again plants produce ſeeds; but they are entirely unfit for propagation, unleſs fecundation precedes, which is performed by an intercourſe between different ſexes, as experience teſtifies. Plants therefore muſt be provided with organs of generation; in which reſpect they are analogous to animals. — Since in every plant the flower always precedes the fruit, and the fecundated ſeeds evidently ariſe from the fruit; it is evident that the organs of generation are contained in the flower, which organs are called *antheræ* and *ſtigmata*, and that the impregnation is accompliſhed within the flower. This impregnation is performed by means of the duſt of the antheræ falling upon the moiſt ſtigmata, where the duſt adheres, is burſt, and ſends forth a very ſubtile matter, which is abſorbed by the ſtyle, and is conveyed down to the rudiments of the ſeed, and thus renders it fertile. When this operation is over, the organs of generation wither and fall, nay a change in the whole flower enſues. We muſt, however, obſerve, that in the vegetable kingdom one and the ſame flower does not always contain the organs of generation of both ſexes, but oftentimes the male organs are on one plant and the female on another. But that the buſineſs of impregnation may go on ſucceſsfully, and that no plant may be deprived of the neceſſary duſt, the whole moſt elegant apparatus of the antheræ and ſtigmata in every flower is contrived with wonderful wiſdom.

For in moſt flowers the ſtamina ſurround the piſtils, and are of about the ſame height: but there are many plants in which the piſtil is longer than the ſtamina; and in theſe it is wonderful to obſerve, that the Creator has made the flowers recline, in order that the duſt may the more eaſily fall into the ſtigma, *e. g.* in the campanula, cowſlip, &c. This curious phenomenon did not eſcape the poetical eye of Milton, who deſcribes it in the following enlivened imagery:

With cowſlips wan, that hang the penſive head.

But when the fecundation is completed, the flowers riſe again, that the ripe ſeeds may not fall out before they are diſperſed by the winds. In other flowers, on the contrary, the piſtil is ſhorter, and there the flowers preſerve an erect ſituation; nay, when the flowering comes on, they become erect, though before they were drooping, or immerſed under water. Laſtly, whenever the male flowers are placed below the female ones, the leaves are exceedingly ſmall and narrow, that they may not hinder the duſt from flying upwards like ſmoke; as we ſee in the pine, fir, yew, ſea-grape, juniper, cypreſs, &c. And when in one and the ſame ſpecies one plant is male and the other female, and conſequently may be far from one another, there the duſt, without which there is no impregnation, is carried in abundance by the help of the wind from the male to the female; as in the whole diœcious claſs. Again, a more difficult impregnation is compenſated by the longevity of the individuals, and the continuation of life by buds, ſuckers, and roots; ſo that we may obſerve every thing moſt wiſely diſpoſed in this affair. Moreover, we cannot without admiration obſerve, that moſt flowers expand themſelves when the ſun ſhines forth; whereas when clouds, rain, or the evening come on, they cloſe up, leſt the genital duſt ſhould be coagulated or rendered uſeleſs, ſo that it cannot be conveyed to the ſtigmata. But what is ſtill more remarkable and wonderful, when the fecundation is over, the flowers neither in rain, nor on the approach of night, cloſe themſelves up. Hence when rain falls in the flowering time, the huſbandman and gardener foretel a ſcarcity of fruits. To mention only one particular more: The organs of generation, which in the animal kingdom are by nature generally removed from ſight, in the vegetable are expoſed to the eyes of all; and that when their nuptials are celebrated, it is wonderful what delight they afford to the ſpectator by their moſt beautiful colours and delicious odours. At this time bees, flies, and other inſects, ſuck honey out of their nectaries, not to mention the humming bird; and that from their effete duſt the bees gather wax. All the experiments that have hitherto been made ſeem to confirm the hypotheſis above unfolded; although it has lately been controverted by the author of the *Philoſophy of Natural Hiſtory*.

As to the diſſemination of ſeeds when brought to maturity, it being abſolutely neceſſary, ſince without it no crop could follow, the Author of nature has wiſely provided for this affair in numberleſs ways. The ſtalks and ſtems [illegible]; [illegible] raiſe the fruit above the ground, that the winds ſhaking them to and fro, may diſperſe far off the ripe ſeeds. Moſt of the pericarpies are ſhut at top, that the ſeeds may not fall before they are ſhaken out by ſtormy winds. Wings are given to many ſeeds, by the help of which they fly far from the mother-plant, and oftentimes ſpread over a whole country. Theſe wings conſiſt either of a down, as in moſt of the compoſite-flowered plants; or of a membrane, as in the birch, alder, aſh, &c. Hence woods, which happen to be conſumed by fire or any other accident, will ſoon be reſtored again by new plants diſſeminated by this means. Many kinds of fruits are endued with a remarkable elaſticity, by the force of which the ripe pericarpies throw the ſeeds to a great diſtance; as the wood-ſorrel, the ſpurge, the phyllanthus, the dittany. Other ſeeds or pericarpies are rough, or provided with hooks; ſo that they are apt to ſtick to animals that paſs by them, and by this means are carried to their holes, where they are both ſown and manured by nature's wonderful care: and therefore the plants of theſe ſeeds grow where others will not; as hound's-tongue, agrimony, &c.

Berries and other pericarpies are by nature allotted for aliment to animals; but with this condition, that while they eat the pulp they ſhall ſow the ſeed: for when they feed upon it, they either diſperſe them at the ſame time; or, if they ſwallow them they are returned with intereſt, for they always come out unhurt. It is not therefore ſurpriſing, that if a field be manured with recent mud or dung, not quite rotten, various other plants, injurious to the farmer, ſhould come up along with the grain that is ſowed. Many have believed that barley or rye has been changed into oats, although all ſuch changes or metamorphoſes are repugnant to the laws of generation; not conſidering, that there is another cauſe of this phenomenon, viz. that the ground, which perhaps had been manured with horſe-dung, in which the ſeeds of oats, coming entire from the

horſes,

horſe, lie hid and produce that grain. The miſletoe always grows upon other trees, becauſe the thruſh that eats the ſeeds of it, caſts them forth with its dung; and as bird-catchers make their bird-lime of this ſame plant, and daub the branches of trees with it, in order to catch the thruſh, the proverb hence took its riſe:

> The thruſh, when he befouls the bough,
> Sows for himſelf the ſeeds of woe.

It is not to be doubted, but that the greateſt part of the junipers alſo that fill our woods, are ſown by thruſhes, and other birds, in the ſame manner; as the berries, being heavy, cannot be diſperſed far by the winds. The croſs bill that lives on the fir-cones, and the haw-finch that feeds on the pine-cones, at the ſame time ſow many of their ſeeds; eſpecially when they carry the cone to a ſtone, or trunk of a tree, that they may more eaſily ſtrip it of its ſcales. Swine likewiſe, by turning up the earth, and moles by throwing up hillocks, prepare the ground for ſeeds in the ſame manner as the ploughman does.

We paſs over many other things which might be mentioned concerning the ſea, lakes, and rivers, by the help of which oftentimes ſeeds are conveyed unhurt to diſtant countries. A variety of other ways in which nature provides for the diſſemination of plants, has been pointed out by Linnæus in an *Oration concerning the augmentation of the habitable earth*. As there is ſomething very ingenious and quite new in the treatiſe here referred to, we ſhall, for the ſake of thoſe who cannot read the original, add a ſhort abſtract of it. His deſign is to ſhow, that there was only one pair of all living things, created at the beginning. According to the account of Moſes, ſays the author, we are ſure that this was the caſe in the human ſpecies; and by by the ſame account we are informed that this firſt pair was placed in Eden, and that Adam gave names to all the animals. In order therefore that Adam might be enabled to do this, it was neceſſary that all the ſpecies of animals ſhould be in paradiſe; which could not happen unleſs alſo all the ſpecies of vegetables had been there likewiſe. This he proves from the nature of their food; particularly in relation to inſects, moſt of which live upon one plant only. Now had the world been formed in its preſent ſtate, it could not have happened that all the ſpecies of animals ſhould have been there. They muſt have been diſperſed over all the globe, as we find they are at preſent; which he thinks improbable for other reaſons which we ſhall paſs over for ſake of brevity. To ſolve all the phenomena, then, he lays down as a principle, That at the beginning all the earth was covered with the ſea, unleſs one iſland large enough to contain all animals and vegetables. This principle he endeavours to eſtabliſh by ſeveral phenomena, which makes it probable that the earth has been and is ſtill gaining upon the ſea, and does not forget to mention foſſil ſhells and plants every where found, which he ſays cannot be accounted for by the deluge. He then undertakes to ſhow how all vegetables and animals might in Britain have a ſoil and climate proper for each, only by ſuppoſing it to be placed under the equator, and crowned with a very high mountain. For it is well known that the ſame plants are found on the Swiſs, the Pyrenean, the Scots Alps, on Olympus, Lebanon, Ida, as on the Lapland and Greenland Alps. And Tournefort found at the bottom of Mount Ararat the common plants of Armenia, a little way up thoſe of Italy, higher ſtill ſuch as grow about Paris, afterwards the Swediſh plants, and laſtly on the top the Lapland Alpine plants; and I myſelf, adds the author, from the plants growing on the Dalecarlian Alps could collect how much lower they were than the Alps of Lapland. He then proceeds to ſhew how from one plant of each ſpecies, the immenſe number of individuals now exiſting might ariſe. He gives ſome inſtances of the ſurpriſing fertility of certain plants; e. g. the elecampane, one plant of which produced 3000 ſeeds; of ſpelt, 2000; of the ſun-flower, 4000; of the poppy, 3200; of tobacco, 40,320. But ſuppoſing an annual plant producing yearly only two ſeeds, even of this, after 20 years, there would be 1,048,576 individuals. For they would increaſe yearly in a duple proportion, viz. 2, 4, 8, 16, 32, &c. He then gives ſome inſtances of plants brought from America, that are now become common over many parts of Europe. Laſtly, he enters upon a detail of the ſeveral methods which nature has taken to propagate vegetables, which is extremely curious, but too long to inſert in this place.

II. Preservation.

1. The great Author and Parent of all things decreed, that the whole earth ſhould be covered with plants, and that no place ſhould be void, none barren. But ſince all countries have not the ſame changes of ſeaſons, and every ſoil is not equally fit for every plant; he therefore, that no place ſhould be without ſome, gave to every one of them ſuch a nature, as might be chiefly adapted to the climate; ſo that ſome of them can bear an intenſe cold, others an equal degree of heat; ſome delight in dry ground, others in moiſt, &c. Hence the ſame plants grow only where there are the ſame ſeaſons of the year, and the ſame ſoil.

The Alpine plants live only in high and cold ſituations; and therefore often on the Alps of Armenia, Switzerland, the Pyreneans, &c. whoſe tops are equally covered with eternal ſnows as thoſe of the Lapland Alps, plants of the ſame kind are found, and it would be in vain to look for them any where elſe. It is remarkable, in relation to the Alpine plants, that they blow, and ripen their ſeeds very early, leſt the winter, ſhould ſteal upon them on a ſudden, and deſtroy them.

Our northern plants, although they are extremely rare every where elſe, yet are found in Siberia, and about Hudſon's Bay; as the arbutus, bramble, winter-green, &c.

Plants impatient of cold live within the torrid zones; hence both the Indies, though at ſuch a diſtance from one another, have plants in common. The Cape of Good Hope, we know not from what cauſe, produces plants peculiar to itſelf; as all the meſembryanthema, and almoſt all the ſpecies of aloes. Graſſes, the moſt common of all plants, can bear almoſt any temperature of air: in which the good providence of the Creator particularly appears; for all over the globe, they above all plants are neceſſary for the nouriſhment of cattle; and the ſame thing is ſeen in relation to our moſt common grains.

Thus neither the ſcorching ſun, nor the pinching cold, hinders any country from having its vegetables.

Nor is there any ſoil which does not bring forth many kinds of plants. The pond-weeds, the water-lily, lobelia, inhabit the waters. The fluviales, fuci, confervæ, cover the bottoms of rivers, and ſea. The ſphagna * fill the marſhes. The brya † clothe the plains. The drieſt woods, and places ſcarce ever illuminated by the rays of the ſun, are adorned with the hypna. Nay, ſtones and the trunks of trees are not excepted, for theſe are covered with various kinds of liverwort.

The deſart and moſt ſandy places have their peculiar trees and plants; and as rivers or brooks are very ſeldom found there, we cannot without wonder obſerve that many of them diſtil water, and by that means afford the greateſt comfort both to man and beaſt that travel there. Thus the tillandſia ‡, which is a paraſitical plant, and grows on the tops of trees in the deſarts of Africa, has its leaves turned at the baſe into the ſhape of a pitcher with the extremity expanded: in theſe the rain is collected, and preſerved for thirſty men, birds, and beaſts.

The water-tree in Ceylon produces cylindrical bladders, covered with a lid; into theſe is ſecreted a moſt pure and refreſhing water, having the taſte of nectar. There is a kind of cuckow-pint in New France, that if you break a branch of it will afford you a pint of excellent water. How wiſe, how beautiful, is the agreement between the plants of every country, and its inhabitants, and other circumſtances!

2. Plants oftentimes by their very ſtructure contribute remarkably both to their own preſervation and that of others. But the wiſdom of the Creator appears no where more than in the manner of the growth of trees. For as their roots deſcend deeper than thoſe of other plants, proviſion is thereby made, that they ſhall not rob them too much of nouriſhment; and what is ſtill more, a ſtem not above a ſpan in diameter often ſhoots up its branches very high; theſe bear perhaps many thouſand buds, each of which is a plant, with its leaves, flowers, and ſtipulæ. Now if all theſe grew upon the plain, they would take up a thouſand times as much ſpace as the tree does; and in this caſe there would ſcarcely be room in all the earth for ſo many plants as at preſent the trees alone afford. Beſides, plants that ſhoot up in this way are more eaſily preſerved from cattle by a natural defence; and farther, their leaves falling in autumn cover the plants growing about againſt the rigour of the winter; and in the ſummer they afford a pleaſing ſhade, not only to animals, but to plants, againſt the intenſe heat of the ſun. We may add, that trees, like all other vegetables, imbibe the water from the earth; which water does not circulate again to the root, as the ancients imigined, but being diſperſed, like ſmall rain, by the tranſpiration of the leaves, moiſtens the plants that grow around. Again, many trees bear fleſhy fruits of the berry or apple kind, which, being ſecure from the attack of cattle, grow ripe for the uſe of man and other animals, while their ſeeds are diſperſed up and down after digeſtion. Laſtly, the particular ſtructure of trees contributes very much to the propagation of inſects; for theſe chiefly lay their eggs upon the leaves, where they are ſecure from the reach of cattle.

Ever-green trees and ſhrubs in the northern parts are chiefly found in the moſt barren woods, that they may be a ſhelter to animals in the winter. They loſe their leaves only every third year, as their ſeeds are ſufficiently guarded by the moſſes, and do not want any other covering. The palms in the hot countries perpetually keep their leaves, for there the ſeeds ſtand in no need of any ſhelter whatever.

Many plants and ſhrubs are armed with thorns, *e. g.* the buckthorn, ſloe, carduus, cotton-thiſtle, &c. that they may keep off the animals which otherwiſe would deſtroy their fruit. Theſe at the ſame time cover many other plants, eſpecially of the annual kind, under their branches. Nay it has frequently been obſerved upon commons where furze grows, that wherever there was a buſh left untouched for years by the commoners, ſome tree has ſprung up being ſecured by the prickles of that ſhrub from the bite of cattle. So that while the adjacent grounds are robbed of all plants by the voracity of animals, ſome may be preſerved to ripen flowers and fruit, and ſtock the parts about with ſeeds, which otherwiſe would be quite extirpated.

All herbs cover the ground with their leaves, and by their ſhade hinder it from being totally deprived of that moiſture which is neceſſary to their nouriſhment. They are moreover an ornament to the earth, eſpecially as leaves have a more agreeable verdure on the upper than on the under ſide.

The moſſes which adorn the moſt barren places, at the ſame time, preſerve the leſſer plants when they begin to ſhoot, from cold and drought; as we find by experience in our gardens, that plants are preſerved in the ſame way. They alſo hinder the fermenting earth from forcing the roots of plants upwards in the ſpring, as we ſee happen annually to trunks of trees, and other things put into the ground. Hence very few moſſes grow in the warmer climates, as not being ſo neceſſary to that end in thoſe places.

The Engliſh ſea mat-weed, or marran, will bear no ſoil but pure ſand, which nature has alloted to it. Sand, the produce of the ſea, is blown by winds oftentimes to very remote parts, and deluges, as it were, woods and fields. But where this graſs grows, it frequently fixes the ſand, gathers it into hillocks, and thrives ſo much, that by means of this alone at laſt an entire hill of ſand is raiſed. Thus the ſand is kept in bounds, other plants are preſerved free from it, the ground is increaſed, and the ſea is repelled by this wonderful diſpoſition of nature. This ſeems to be the ſame plant which is called in Scotland *lent*, and is particularly uſeful for the purpoſe above-mentioned, and only grows among ſand along the ſea-coaſt.

How ſolicitous nature is about the preſervation of graſſes is abundantly evident from hence, that the more the leaves of the perennial graſſes are eat, the more they creep by the roots, and ſends forth offsets. For the Author of nature intended that vegetables of this kind, which have very ſlender and erect leaves ſhould be copious, and very thick ſet, covering the ground like a carpet; and thus afford food ſufficient for ſo vaſt a quantity of grazing animals. But what chiefly increaſes our wonder is, that although the graſſes are the principal food of ſuch animals, yet they are forbid as it were to touch the flower and ſeed-bearing ſtems, that ſo the ſeeds may ripen and be ſown.

The caterpillar or grub of the moth, although it feeds upon graſſes, to the great deſtruction of them

* A kind of moſs.

† Another kind of moſs.

‡ A kind of miſletoe.

in meadows yet it ſeems to be formed in order to keep a due proportion between theſe and other plants; for graſſes, when left to grow freely, increaſe to that degree, that they exclude all other plants; which would conſequently be extirpated, unleſs this inſect ſometimes prepared a place for them. Hence always more ſpecies of plants appear in thoſe places where this caterpillar has laid waſte the paſtures the preceding year than at any other time.

III. Destruction.

Daily experience teaches us, that all plants, as well as other created things, muſt ſubmit to death.

They ſpring up, they grow, they flouriſh they ripen their fruit, they wither, and at laſt, having finiſhed their courſe they die, and return to the duſt again, from whence they firſt took their riſe. Thus all black mould, which every where covers the earth, for the greateſt part is owing to dead vegetables. For all roots deſcend into the ſand by their branches, and after a plant has loſt its ſtem the root remains; but this too rots at laſt; and changes into mould. By this means this kind of earth is mixed with ſand, by the contrivance of nature, nearly in the ſame way as dung thrown upon fields is wrought into the earth by the induſtry of the huſbandman. The earth thus prepared offers again to plants from its boſom what it has received from them. For when ſeeds are committed to the earth, they draw to themſelves, accomodate to their nature, and turn into plants, the more ſubtile parts of this mould by the co-operation of the ſun air, and rains; ſo that the talleſt tree is, properly ſpeaking, nothing but mould wonderfully compounded with air and water, and modified by a virtue communicated to a ſmall ſeed by the Creator. From theſe plants when they die, juſt the ſame kind of mould is formed as gave birth to them originally; whence fertility remains continually uninterrupted. Whereas the earth could not make good its annual conſumption, unleſs it were conſtantly recruited by new ſupplies.

The cruſtaceous liverworts are the firſt foundation of vegetation; and therefore are plants of the utmoſt conſequence in the œconomy of nature, though ſo deſpiſed by us. When rocks firſt immerge out of the ſea, they are ſo poliſhed by the force of the waves, that ſcarce any herb can find a fixed habitation upon them; as we may obſerve every where near the ſea. But the very minute cruſtaceous liverworts begin ſoon to cover theſe dry rocks, although they have no other nouriſhment but that ſmall quantity of mould and imperceptible particles which the rain and the air bring thither.

Theſe liverworts dying at laſt turn into a very fine earth; on this earth the imbricated liverworts find a bed to ſtrike their roots in. Theſe alſo die after a time and turn to mould; and then the various kinds of moſſes, *e. g.* the hypna, the brya, polytricha, find a proper place and nouriſhment. Laſtly theſe dying in their turn, and rotting, afford ſuch plenty of new-formed mould, that herbs and ſhrubs eaſily root and live upon it.

That trees, when they are dry or are cut down, may not remain uſeleſs to the world, and lie as it were melancholy ſpectacles, nature haſtens on their deſtruction in a ſingular way: firſt, the liverworts begin to ſtrike root in them; afterwards the moiſture is drawn out of them: whence putrefaction follows. Then the muſhroom kinds find a fit place for nouriſhment on them and corrupt them ſtill more. The beetle called *dermeſtes* next makes himſelf a way between the bark and the wood. The muſk-beetle, the copper tale-beetle, and the caterpillar or coſſua 812 *(S.N.)* bores an infinite number of holes through the trunk. Laſtly, the woodpeckers come, and, while they are ſeeking for inſects, wear away the tree already corrupted: till the whole paſſes into earth. Such induſtry does nature uſe to deſtroy the trunk of a tree! Nay, trees immerſed in water would ſcarcely ever be deſtroyed, were it not for the worm which eats ſhips, which performs this work; as the ſailor knows by ſad experience.

Thiſtles, as the moſt uſeful of plants, are armed and guarded by nature herſelf. Suppoſe there were a heap of clay, on which for many years no plant has ſprung up; let the ſeeds of the thiſtle blow there, and grow, the thiſtles by their leaves attract the moiſture out of the air, ſend it into the clay by means of their roots, will thrive themſelves, and afford a ſhade. Let now other plants come hither, and they will ſoon cover the ground.

All ſucculent plants make ground fine, of a good quality, and in great plenty; as ſedum, craſſula, aloe, algæ. But dry plants make it more barren, as heath, pines, moſs; and therefore nature has placed the ſucculent plants on rocks and the drieſt hills.

Sect. IV. *The Animal Kingdom.*

I. Propagation.

1. The generation of animals holds the firſt place among all things that raiſe our admiration when we conſider the works of the Creator; and chiefly that appointment by which he has regulated the conception of the fœtus, and its excluſion, that it ſhould be adapted to the diſpoſition and way of living of each animal, is moſt worthy of our attention.

We find no ſpecies of animals exempt from the ſtings of love, which is put into them to the end that the Creator's mandate may be executed, *Increaſe and multiply*: and that thus the egg, in which is contained the rudiment of the fœtus, may be fecundated: for without fecundation all eggs are unfit to produce an offspring.

Foxes and wolves, ſtruck with theſe ſtings, every where howl in the woods; crowds of dogs follow the female; bulls ſhow a terrible countenance, and very different from that of oxen. Stags every year have new horns, which they loſe after rutting time. Birds look more beautiful than ordinary, and warble all day long through laſciviouſneſs. Thus ſmall birds labour to outſing one another, and cocks to outcrow. Peacocks ſpread forth again their gay and glorious trains. Fiſhes gather together, and exult in the water; and graſhoppers chirp, and pipe, as it were, amongſt the herbs. The ants gather again into colonies, and repair to their citadels. We paſs over many other particulars which this ſubject affords, to avoid prolixity.

2. The fecondated egg requires a certain and proportionate degree of heat for the expanſion of the

ſtamina of the embryo. That this may be obtained, nature operates in different manners; and therefore we find in different claſſes of animals a different way of excluding the fœtus.

The females of quadrupeds have an uterus, contrived for eaſy geſtation, temperate and cheriſhing warmth, and proper nouriſhment of the fœtus, as moſt of them live upon the earth, and are there fed.

Birds, in order to get ſubſiſtence, and for other reaſons, are under a neceſſity of ſhifting place; and that not upon their feet, but wings. Geſtation therefore would be burthenſome to them. For this reaſon they lay eggs, covered with a hard ſhell. Theſe they ſit upon by a natural inſtinct, and cheriſh till the young one comes forth.

The oſtrich and caſſowary are almoſt the only birds that do not obſerve this law; theſe commit their eggs to the ſand, where the intenſe heat of the ſun excludes the fœtus.

Fiſhes inhabit cold waters, and moſt of them have cold blood; whence it happens that they have not heat ſufficient to produce the fœtus. The all-wiſe Creator therefore has ordained, that moſt of them ſhould lay their eggs near the ſhore; where, by means of the ſolar rays, the water is warmer, and alſo fitter for that purpoſe; and alſo becauſe water-inſects abound more there, which afford the young fry nouriſhment.

Salmon, when they are about to lay their eggs, are led by inſtinct to go up the ſtream, where the water is freſh and more pure.

The butterfly-fiſh is an exception, for that brings forth its fœtus alive.

The fiſh of the ocean, which cannot reach the ſhores by reaſon of the diſtance, are alſo exempt from this law. The Author of nature has given to this kind eggs that ſwim; ſo that they are hatched amidſt the ſwimming fucus, called *ſargazo**.

The cetaceous fiſh have warm blood; and therefore they bring forth their young alive, and ſuckle them with with their teats.

Many amphibious animals bring forth live fœtuſes, as the viper and the toad, &c. But the ſpecies that lay eggs, lay them in places where the heat of the ſun ſupplies the warmth of the parent.

Thus the reſt of the frog kind, and the lizard kind, lay their eggs in warm waters; the common ſnake, in dunghills, and ſuch like warm places; and give them up to nature, as a provident nurſe, to take care of them. The crocodile and ſea-tortoiſes go aſhore to lay their eggs under the ſand, where the heat of the ſun hatches them.

Moſt of the inſect kind neither bear young nor hatch eggs: yet their tribes are the moſt numerous of all living creatures; inſomuch, that if the bulk of their bodies were proportionate to their quantity, they would ſcarce leave room for any other kinds of animals. Let us ſee therefore with what wiſdom the Creator has managed about the propagation of theſe minute creatures. The females by natural inſtinct meet and copulate with the males; and afterwards lay their eggs: but not indiſcriminately in every place. For they all know how to chooſe ſuch places as may ſupply their offspring in its tender age with nouriſhment, and other things neceſſary to ſatisfy their natural wants: for the mother, ſoon after ſhe has laid her eggs, dies; and were ſhe to live, ſhe would not have it in her power to take care of her young.

Butterflies, moths, ſome beetles, weevils, bugs, cuckow-ſpit inſects, gall-inſects, tree-bugs, &c. lay their eggs on the leaves of plants, and every different kind chooſes its own ſpecies of plant. Nay, there is ſcarce any plant which does not afford nouriſhment to ſome inſect; and ſtill more, there is ſcarcely any part of a plant which is not preferred by ſome of them. Thus one inſect feeds upon the flower; another upon the trunk; another upon the root; and another upon the leaves. But we cannot help wondering particularly, when we ſee how the leaves of ſome trees and plants, after eggs have been let into them, grow into galls; and form dwellings, as it were, for the young ones. Thus when the gall-inſect has fixed her eggs in the leaves of an oak, the wound of the leaf ſwells, and a knob like an apple ariſes, which includes and nouriſhes the embryo.

When the tree-bug has depoſited its eggs in the boughs of the fir-tree, excreſcences ariſe ſhaped like pearls. When another ſpecies of the tree-bug has depoſited its eggs in the mouſe-ear chickweed or the ſpeedwell, the leaves contract in a wonderful manner into the ſhape of a head. The water-ſpider excludes eggs either on the extremities of the juniper, which from thence forms a lodging, that looks like the arrow-headed graſs; or on the leaves of the poplar, from whence a red globe is produced. The tree-louſe lays its eggs on the leaves of the black poplar, which turn into a kind of inflated bag; and ſo in other inſtances. Nor is it upon plants only that inſects live and lay their eggs. The gnats commit theirs to ſtagnating waters. The water-inſect called *monoculus* often increaſes ſo immenſely on pools, that the red legions of them have the apearance of blood. Others lay their eggs in other places: *e. g.* the beetle, in dunghills; the dermeſtes, in ſkins; the fleſh fly, in putrified fleſh: the cheeſe-maggot, in the cracks of cheeſe, from whence the caterpillars iſſuing forth, ofentimes conſume the whole cheeſe, and deceive many people, who fancy the worms are produced from the particles of the cheeſe itſelf, by a generation called *equivocal*, which is extremely abſurd. Others exclude their eggs upon certain animals. The mill-beetle lays its eggs between the ſcales of fiſhes: the ſpecies of gad-fly, on the back of cattle; the ſpecies 1025 *(S. N.)* on the back of the rein-deer; the ſpecies 1026, in the noſes of ſheep. The ſpecies 1028 lodges during the winter in the inteſtinal tube, or the throat of horſes, nor can it be driven out till the ſummer comes on. Nay, inſects themſelves are often ſurrounded with the eggs of other inſects, inſomuch that there is ſcarcely an animal to be found which does not afford food for other animals. Almoſt all the eggs of inſects, when laid, are ordained to undergo, by a wonderful law of nature, various metamorphoſes, *e. g.* the egg of the butterfly, being laid in the cabbage, firſt of all becomes a caterpillar, that feeds on the herb, crawls, and has 16 feet. This afterwards changes into a nymph, that has no feet, is ſmooth, and eats nothing; and laſtly, this burſts into a butterfly that flies, has variety of colours, is hairy, and lives upon honey. What can be more worthy of admiration than that one and the ſame animal ſhould appear on the ſtage of life under ſo many characters, as if it were three diſtinct animals. Linnæus (*Amæn. Academ.* tom. ii.) in a treatiſe on the wonders relating to inſects, ſays, "As ſurpriſing as theſe transformations may ſeem, yet much the ſame happens when a chicken is hatched; the only difference is, that this chicken breaks all three coats at once, the butterfly one after another."

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* Flor. Zeyl. 389.

The laws of generation of worms are ſtill very obſcure; as we find they are ſometimes produced by eggs, ſometimes by offsets, juſt in the ſame manner as happens to trees. It has been obſerved with the greateſt admiration, that the polypus or hydra (*S. N.* 221.) lets down ſhoots and live branches, by which it is multiplied. Nay more, if it be cut into many parts, each ſegment, put into the water, grows into a perfect animal; ſo that the parts which were torn off are reſtored, and form a complete and perfect animal like that from which it was torn.

3. The multiplication of animals is not tied down to the ſame rules in all; for ſome have a remarkable power of propagating, others are confined within narrow limits in this reſpect. Yet in general we find, that nature obſerves this order, that the leaſt animals, and thoſe which are uſeful and ſerve for nouriſhment to the greateſt number of other animals, are endued with a greater power of propagating than others.

Mites, and many other inſects, will multiply to a thouſand within the compaſs of a very few days; while the elephant ſcarcely produces one young in two years.

The hawk-kind generally lay not above two eggs, at moſt four; while the poultry kind produce from 50 to 100.

The diver, or loon, which is eaten by few animals, lays alſo two eggs; but the duck kind, the moor-game, partridges, &c. and ſmall birds, lay a very large number.

If you ſuppoſe two pigeons to hatch nine times a-year, they may produce in four years 14,760 young. They are endued with this remarkable fertility, that they may ſerve for food, not only for man, but for hawks and other birds of prey. Nature has made harmleſs and eſculent animals fruitful. She has forbid the bird kinds to fall ſhort of the number of eggs allotted to each ſpecies: and therefore, if the eggs which they intend to ſit upon be taken away a certain number of times, they preſently lay others in their room, as may be ſeen in the ſwallow, duck, and ſmall birds.

II. Preservation.

1. Preſervation follows generation: this appears chiefly in the tender age, while the young are unable to provide for their own ſupport. For then their parents, though otherwiſe ever ſo fierce in their diſpoſition, are affected with a wonderful tenderneſs or ſenſe of love towards their progeny, and ſpare no pains to provide for, guard, and preſerve them; and that not by an imaginary law, but one given by the Lord of nature himſelf.

Quadrupeds give ſuck to their tender young, and ſupport them by a liquor perfectly eaſy of digeſtion, till nature enables them to digeſt what is more ſolid. Nay, their love toward them is ſo great, that they endeavour to repel with the utmoſt force every thing which threatens danger or deſtruction to them. The ewe, which brings forth two lambs at a time, will not admit one to her teats unleſs the other be preſent and ſuck alſo; leſt one ſhould famiſh, while the other grows fat.

Birds build their neſts in the moſt artificial manner, and line them as ſoft as poſſible, for fear the eggs ſhould get any damage. Nor do they build promiſcuouſly in any place, but there only where they may quietly lie concealed and be ſafe from the attacks of their enemies.

The hanging bird makes its neſt of the fibres of withered plants, and the down of the poplar ſeeds, and fixes it upon the bough of ſome tree hanging over the water, that it may be out of reach.

The diver places its ſwimming neſt upon the water itſelf, amongſt the ruſhes. We deſignedly paſs over many inſtances of the like kind.

Again, birds ſit on their eggs with ſo much patience, that many of them chooſe to periſh with hunger, rather than expoſe the eggs to danger by going to ſeek for food.

The male rooks and crows, at the time of incubation, bring food to the females.

Pigeons, ſmall birds, and other birds which pair, ſit by turns; but where polygamy prevails, the males ſcarcely take any care of the young.

Moſt of the duck kind pluck off their feathers in great quantity, and cover their eggs with them, leſt they ſhould be damaged by the cold when they quit their neſts for the ſake of food; and when the young are hatched, who knows not how ſolicitous they are in providing for them till they are able to fly and ſhift for themſelves?

Young pigeons would not be able to make uſe of hard ſeeds for nouriſhment, unleſs the parents were to prepare them in their crops, and thence feed them.

The owl called the *eagle-owl* makes its neſt on the higheſt precipices of mountains, and in the warmeſt ſpot, facing the ſun; that the dead bodies brought there may by the heat melt into a ſoft pulp, and become fit nouriſhment for the young.

As an exception indeed to this foſtering care of animals, may be mentioned the cuckow, which lays its eggs in the neſt of other ſmall birds, generally the wag-tail, yellow hammer, or white-throat, and leaves the incubation or preſervation of the young to them. This cuſtom of the cuckow is ſo extraordinary, and out of the common courſe of nature, that it would not be credible were it not for the teſtimony of the moſt knowing and curious natural-hiſtorians, ſuch as Ray, Willoughby, Geſner, Aldrovandus, Ariſtotle, &c. But this ſeeming want of inſtinct is accounted for from the ſtructure and ſituation of its ſtomach, which diſqualifies it for incubation †; and its inſtinctive care is ſtill conſpicuous in providing a proper, though a foreign, nidus for its eggs.

Amphibious animals, fiſhes, and inſects, which cannot come under the care of their parents, yet owe this to them, that they are put in places where they eaſily find nouriſhment.

2. As ſoon as animals come to maturity, and want no longer the care of their parents, they attend with the utmoſt labour and induſtry, according to the law and œconomy appointed for every ſpecies, to the pre-

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† See the article Cucubus.

ſervation of their lives. But that ſo great a number of them, which occur every-where, may be ſupported, and a certain and fixed order may be kept up amongſt them, behold the wonderful diſpoſition of the Creator, in aſſigning to each ſpecies certain kinds of food, and in putting limits to their appetites. So that ſome live on particular ſpecies of plants, which particular regions and ſoils only produce; ſome on particular animalcula; others on carcaſes; and ſome even on mud and dung. For this reaſon, Providence has ordained that ſome ſhould ſwim in certain regions of the watery element; others ſhould fly: ſome ſhould inhabit the torrid, the frigid, or the temperate zones; and others ſhould frequent deſarts, mountains, woods, pools, or meadows, according as the food proper to their nature is found in ſufficient quantity. By this means there is no terreſtrial tract, no ſea, no river, no country, but what contains and nouriſhes various kinds of animals. Hence alſo an animal of one kind cannot rob thoſe of another kind of its aliment; which, if it happened, would endanger their lives or health: and thus the world at all times affords nouriſhment to ſo many and ſo large inhabitants, at the ſame time that nothing which it produces is uſeleſs or ſuperfluous.

It will not be here amiſs to produce ſome inſtances by which it will appear how providentially the Creator has furniſhed every animal with ſuch cloathing as is proper for the country where they live, and alſo how excellently the ſtructure of their bodies is adapted to their particular way of life; ſo that they ſeem to be deſtined ſolely to the places where they are found.

Monkeys, elephants, and rhinoceroſes, feed upon vegetables that grow in hot countries, and therefore therein they have their allotted places. When the ſun darts forth its moſt fervid rays, theſe animals are of ſuch a nature and diſpoſition, that it does them no manner of hurt; nay, with the reſt of the inhabitants of thoſe parts, they go naked; whereas, were they covered with hairy ſkins, they muſt periſh with heat.

On the contrary, the place of rein-deer is fixed in the coldeſt part of Lapland, becauſe their chief food is the liverwort, which grows no-where ſo abundantly as there; and where, as the cold is moſt intenſe, the rein-deer are clothed, like the other northern animals, with ſkins filled with the denſeſt hair, by the help of which they eaſily defy the keeneſs of the winter. In like manner the rough-legged partridge paſſes its life in the very Lapland Alps, feeding upon the ſeeds of the dwarf birch; and, that they may run up and down ſafely amidſt the ſnow, their feet are feathered.

The camel frequents the ſandy and burning deſarts, in order to get the barren camel's-hay. How wiſely has the Creator contrived for him! he is obliged to go through the deſarts, where oftentimes no water is found for many miles about. All other animals would periſh with thirſt in ſuch a journey: but the camel can undergo it without ſuffering; for his belly is full of cells, where he reſerves water for many days. It is reported by travellers, that the Arabians, when in travelling they want water, are forced to kill their camels, and take water out of their bellies that is perfectly good to drink, and not at all corrupted.

The pelican likewiſe lives in deſart and dry places; and is obliged to build her neſt far from the ſea, in order to procure a greater ſhare of heat to her eggs. She is therefore forced to bring water from afar for herſelf and her young; for which reaſon providence has furniſhed her with an inſtrument moſt adapted to this purpoſe: She has a very large bag under her throat, which ſhe fills with a quantity of water ſufficient for many days; and this ſhe pours into the neſt, to refreſh her young, and teach them to ſwim.

The wild beaſts, lions, and tygers, come to this neſt to quench their thirſt, but do no hurt to the young.

Oxen delight in low grounds, becauſe there the food moſt palatable to them grows.

Sheep prefer naked hills, where they find a particular kind of graſs called the *feſtuca*, which they love above all things.

Goats climb up the precipices of mountains, that they may browſe on the tender ſhrubs; and in order to fit them for it, they have feet made for jumping.

Horſes chiefly reſort to woods, and feed upon leafy plants.

Nay, ſo various is the appetite of animals, that there is ſcarcely any plant which is not choſen by ſome, and left untouched by others. The horſe gives up the water-hemlock to the goat. The cow gives up the long-leaved water-hemlock to the ſheep. The goat gives up the monks-head to the horſe, &c.; for that which certain animals grow fat upon, others abhor as poiſon. Hence no plant is abſolutely poiſonous, but only reſpectively. Thus the ſpurge, that is noxious to man, is a moſt wholeſome nouriſhment to the caterpillar. That animals may not deſtroy themſelves for want of knowing this law, each of them is guarded by ſuch a delicacy of taſte and ſmell, that they can eaſily diſtinguiſh what is pernicious from what is wholeſome; and when it happens that different animals live upon the ſame plants, ſtill one kind always leaves ſomething for the other, as the mouths of all are not equally adapted to lay hold of the graſs; by which means there is ſufficient food for all. To this may be referred an œconomical experiment well known to the Dutch, that when eight cows have been in a paſture, and can no longer get nouriſhment, two horſes will do very well there for ſome days; and when nothing is left for the horſes, four ſheep will live upon it.

Swine get proviſion by turning up the earth: for there they find the ſucculent roots, which to them are very delicious.

The leaves and fruits of trees are intended as food for ſome animals, as the ſloth, the ſquirrel; and theſe laſt have feet given them fit for climbing.

Beſides myriads of fiſhes, the caſtor, the ſea-calf, and others, inhabit the water, that they may there be fed; and their hinder-feet are fit for ſwimming, and perfectly adapted to their manner of life.

The whole order of the gooſe-kind, as ducks, merganſer, &c. paſs their lives in water, as feeding upon water inſects, fiſhes, and their eggs. Who does not ſee, that attends ever ſo little, how exactly the wonderful formation of their beaks, their necks, their feet, and their feathers, ſuit their kind of life; which obſervation ought to be extended to all other birds.

The way of living of the ſea-ſwallow deſerves to be particularly taken notice of; for as he cannot ſo commodiouſly plunge into the water, and catch fiſh, as other aquatic birds, the Creator has appointed the ſea-gull to be his caterer, in the following manner: When this laſt is purſued by the former, he is forced to throw up part of his prey, which the other catches; but in the autumn, when the fiſhes hide themſelves in deep places, the merganſer ſupplies the gull with food, as being able to plunge deeper into the ſea.

The chief granary of ſmall birds is the knot graſs, that bears heavy ſeeds, like thoſe of the black-bindweed. It is a very common plant, not eaſily deſtroyed, either by the road-ſide by trampling upon it, or any where elſe; and is extremely plentiful after harveſt in fields, to which it gives a reddiſh hue by its numerous ſeeds. Theſe fall upon the ground, and are gathered all the year round by the ſmall birds. To which we may add, that many ſmall birds feed upon the ſeeds of plantain, particularly linnets. It is generally known that the goldfinch lives upon the ſeed of thiſtles, from which he has its name in Latin and French. Thus bountiful nature feeds the *fowls of the air.*

The Creator has taken no leſs care of ſome amphibious animals, as the ſnake and frog kind; which, as they have neither wings to fly, nor feet to run ſwiftly and commodiouſly, would ſcarcely have any means of taking their prey, were it not that ſome animals run, as it were, of their own accord, into their mouths. When the rattle-ſnake, a native of America, with open jaws fixes his eyes upon a bird, fly, or ſquirrel, ſitting on a tree, they fly down his throat, being rendered ſtupid, and giving themſelves up as deſtitute of all refuge. How dreadful this ſerpent is to other animals will appear by an account we have in a treatiſe entitled, *Radix Senega.* Where the author (*Amœn. Acad.* tom. 2.) ſays, one of theſe terrible ſerpents got clandeſtinely into the houſe of governor Blake at Carolina; where it would have long lain concealed, had it not been that all the domeſtic animals, as dogs, hogs, turkeys, and fowls, admoniſhed the family by their unuſual cries, equally ſhowing their horror and conſternation, their hair, briſtles, and creſts, ſtanding up on end. On the other hand, we cannot but adore the Creator's great goodneſs towards man, when we conſider the rattle which terminates this ſerpent's tail; for by means of that we have an opportunity of guarding againſt this dreadful enemy; the ſound warning us to fly; which if we were not to do, and we ſhould be wounded by him, the whole body would be turned into a putrid corruption in ſix hours, nay ſometimes in half an hour.

The limits of this article will not permit us to produce more examples of this kind. But whoever will be at the pains to take even a ſlight a view of the wonderful works of the Author of nature, will readily ſee how wiſely the plan, order, and fitneſs of things with divine ends, are diſpoſed.

3. We cannot without the utmoſt admiration behold how providentially the Creator has acted as to the preſervation of thoſe animals which, at a certain time of the year, are by the rigour of the ſeaſon excluded from the neceſſaries of life. Thus the bear in the autumn creeps into the moſs which he has gathered, and there lies all winter; ſubſiſting upon no other nouriſhment but his fat, collected during the ſummer in the cellulous membrance,and which without doubt, during his faſt, circulates through his veſſels, and ſupplies the place of food; to which perhaps is added that fat juice which he ſucks out of the bottom of his feet.

The hedge-hog, badger, and mole, in the ſame manner fill their winter-quarters with vegetables, and ſleep during the froſts. The bat ſeems cold and quite dead all the winter. Moſt of the amphibious animals get into dens, or to the bottom of lakes and pools.

In the autumn, as the cold approaches, and inſects diſappear, ſwallows migrate into other climes in ſearch of food and a temperature of air more friendly to their conſtitution: though the latter hatches, or thoſe young birds which are incapable of diſtant flights, ſeek for an aſylum againſt the violence of the cold in the bottom of lakes amongſt the reeds and ruſhes; from whence, by the wonderful appointment of nature, they come forth again. See the article Hirundo. The periſtaltic motion of the bowels ceaſes in all theſe animals while they are obliged to faſt; whence the appetite is diminiſhed, and ſo they ſuffer the leſs from hunger. To this head may be referred the obſervation of the celebrated Liſter concerning theſe animals. That their blood, when let into a veſſel, does not coagulate, as that of all other animals; and ſo is no leſs fit for circulation than before.

The moor-fowls work themſelves out walks under the very ſnow. They moult in the ſummer; ſo that about the month of Auguſt they cannot fly, and are therefore obliged to run into the woods; but then the moor-berries and bilberries are ripe, from whence they are abundantly ſupplied with food. Whereas the young do not moult the firſt ſummer; and therefore, though they cannot run ſo well, are able to eſcape danger by flight.

The reſt of the birds who feed upon inſects migrate every year to foreign regions, in order to ſeek for food in a milder climate; while all the northern parts, where they live well in the ſummer, are covered with ſnow.

By theſe migrations, birds alſo become uſeful to many different countries, and are diſtributed over almoſt all the globe. And it muſt excite our admiration that all of them exactly obſerve the times of coming and going, and that they do not miſtake their way.

Inſects in the winter generally lie hid within their caſes, and are nouriſhed by the ſurrounding liquor like the fœtus of other animals; from whence, at the approach of ſpring, they awake, and fly forth, to the aſtoniſhment of every one.

However, all animals which lie hid in winter do not obſerve theſe laws of faſting. Some provide ſtore-houſes in ſummer and autumn, from which they take what is neceſſary; as mice, jays, ſquirrels, bees.

III. Destruction.

1. We have obſerved above, that all animals do not live upon vegetables, but that there are ſome which

feed upon certain animalcula. Nay, there are ſome which ſubſiſt only by rapine, and daily deſtroy numbers of the peaceable kind.

Theſe animals are deſtroyed, but in ſuch a manner that the weaker generally are infeſted by the ſtronger in a continued ſeries. Thus the tree-louſe lives upon plants. The fly called *muſca aphidivora* lives upon the tree-louſe; the hornet and waſp-fly, upon the muſca aphidivora; the dragon fly, upon the hornet and waſp-fly; the ſpider, on the dragon-fly; the ſmall birds on the ſpider; and laſtly, the hawk kind on the ſmall birds.

In like manner, the monoculus delights in putrid waters, the gnat eats the monoculus, the frog eats the gnat, the pike eats the frog, the ſea-calf eats the pike.

The bat and goat ſucker make their excurſions only at night, that they may catch the moths, which at that time fly about in vaſt quantities.

The woodpecker pulls out the inſects which lie hid in the trunks of trees.

The ſwallow purſues thoſe which fly about in the open air.

The mole purſues worms. The large fiſhes devour the ſmall. Nay, we ſcarcely know an animal which has not ſome enemy to contend with.

Amongſt quadrupeds wild beaſts are moſt remarkably pernicious and dangerous to others, as the hawk kind among birds. But that they may not, by too attrocious a butchery, deſtroy a whole ſpecies, even theſe are circumſcribed within certain bounds. Firſt, as to the moſt fierce of all, it deſerves to be noted how few they are in proportion to other animals. Secondly, the number of them is not equal in all countries. Thus France and England breed no wolves, and the northern countries no tygers or lions. Thirdly, theſe fierce animals ſometimes fall upon and deſtroy one another. Thus the wolf devours the fox. The dog infeſts both the wolf and fox; nay, wolves in a body will ſometimes venture to ſurround a bear. The tiger often kills its own male whelps. Dogs are ſometimes ſeized with madneſs, and deſtroy their fellows, or with the mange deſtroy themſelves.

Laſtly, wild beaſts ſeldom arrive at ſo great an age as animals which live on vegetables. For they are ſubject, from their alkaline diet, to various diſeaſes which bring them ſooner to an end.

But although all animals are infeſted by their peculiar enemies, yet they are often able to elude their violence by ſtratagems and force. Thus the hare often confounds the dog by her windings.

When the bear attacks ſheep and cattle, theſe draw up together for mutual defence. Horſes join heads together, and fight with their heels. Oxen join tails, and fight with their horns.

Swine get together in herds, and boldly oppoſe themſelves to any attack, ſo that they are not eaſily overcome; and it is worth while to obſerve, that all of them place their young, as leſs able to defend themſelves, in the middle that they may remain ſafe during the battle.

Birds, by their different ways of flying, oftentimes eſcape the hawk. If the pigeon had the ſame way of flying as the hawk, ſhe would hardly ever eſcape his claws.

It deſerves alſo to be remarked, how much ſome animals conſult their ſafety by night. When horſes ſleep in woods, one by turn remains awake, and, as it were, keeps watch. When monkeys in Braſil ſleep upon trees, one of them keeps awake, in order to give the ſign when the tiger creeps towards them; and in caſe the guard ſhould be caught aſleep, the reſt tear him to peices. Hence rapacious animals are not always ſucceſsful in their hunting, and are often obliged to labour for a whole day to no purpoſe. For this reaſon the Creator has given them ſuch a nature, that they can bear faſting a long time. Thus the lion lurks in his den many days without famiſhing; and the wolf when he has once well ſatisfied his hunger, can faſt many weeks without any difficulty.

If we conſider the end for which it pleaſed the Supreme Being to conſtitute ſuch an order of nature, that ſome animals ſhould be, as it were, created only to be miſerably butchered by others, it ſeems that his Providence not only aimed at ſuſtaining, but alſo keeping a juſt proportion amongſt all the ſpecies; and ſo prevent any one of them from increaſing too much, to the detriment of men and other animals. For if it be true, as it moſt aſſuredly is, that the ſurface of the earth can ſupport only a certain number of inhabitants, they muſt all periſh if the ſame number were doubled or trebled.

There are ſome viviparous flies which brings forth 2000 young. Theſe in a little time would fill the air, and like clouds intercept the rays of the ſun, unleſs they were devoured by birds, ſpiders, and many other animals.

Storks and cranes free Egypt from frogs, which, after the inundation of the Nile, cover the whole country. Falcons clear Paleſtine of mice. Bellonius on this ſubject ſays as follows: "The ſtorks come to Egypt in ſuch abundance, that the fields and meadows are white with them. Yet the Egyptians are not diſpleaſed with this ſight; as frogs are generated in ſuch numbers there, that did not the ſtorks devour them, they would over-run every thing. Beſides, they alſo catch and eat ſerpents. Between Belba and Gaza, the fields of Paleſtine are often deſart on account of the abundance of mice and rats; and were they not deſtroyed by the falcons that come here by inſtinct, the inhabitants could have no harveſt."

The white fox is of equal advantage in the Lapland Alps; as he deſtroys the Norway rats, which are generated there in great abundance, and thus hinder them from increaſing too much in proportion, which would be the deſtruction of vegetables.

It is ſufficient for us, that nothing is made by Providence in vain; and that whatever is made, is made with ſupreme wiſdom. For it does not become us to pry too boldly into all the deſigns of God. Let us not imagine, when theſe rapacious animals ſometimes do us miſchief, that the Creator planned the order of nature according to our private principles of œconomy: for the Laplanders have one way of living; the European huſbandman another, the Hottentots and ſavages a third; whereas the ſtupendous œconomy of the Deity is one throughout the globe; and if Providence does not always calculate exactly according to our way of reckoning, we ought to conſider this affair in the ſame light, as when different ſeamen

men wait for a fair wind, every one with reſpect to the part he is bound to, who we plainly ſee cannot all be ſatisfied.

2. The whole earth would be overwhelmed with carcaſes and ſtinking bodies, if ſome animals did not delight to feed upon them. Therefore, when an animal dies, bears, wolves, foxes, ravens, &c. do not loſe a moment till they have taken all away. But if a horſe *e.g.* dies near the public road, you will find him, after a few days, ſwoln, burſt, and at laſt filled with innumerable grubs of carniverous flies, by which he is entirely conſumed, and removed out of the way, that he may not become a nuiſance to paſſengers by his poiſonous ſtench.

When the carcaſes of fiſhes are driven upon the ſhore, the voracious kinds, ſuch as the thornback, the hound-fiſh, the conger-eel, &c. gather about and eat them. But becauſe the flux and reflux ſoon change the ſtate of the ſea, they themſelves are often detained in pits, and become a prey to the wild beaſts that frequent the ſhores. Thus the earth is not only kept clean from the putrefaction of carcaſes, but at the ſame time, by the œconomy of nature, the neceſſaries of life are provided for many animals. In the like manner many inſects at once promote their own good, and that of other animals. Thus gnats lay their eggs in ſtagnant, putrid, and ſtinking waters, and the grubs that ariſe from theſe eggs clear away all the putrefaction: and this will eaſily appear, if any one will make the experiment by filling two veſſels with putrid water, leaving the grubs in one, and taking them all out of the other: for then he will ſoon find the water that is full of grubs pure and without any ſtench, while the water that has no grubs will continue ſtinking.

Lice increaſe in a wonderful manner in the heads of children that are ſcabby; nor are they without their uſe, for they conſume the redundant humours.

The beetle kind in ſummer extract all moiſt and glutinous matter out of the dung of cattle, ſo that it becomes like duſt, and is ſpread by the wind over the ground. Were it not for this, the vegetables that lie under the dung would be ſo far from thriving that all that ſpot would be rendered barren.

As the excrements of dogs is of ſo filthy and ſceptic a nature that no inſect will touch them, and therefore they cannot be diſperſed by that means, care is taken that theſe animals ſhould exonerate upon ſtones, trunks of trees or ſome high place that vegetables may not be hurt by them.

Cats bury their dung. Nothing is ſo mean, nothing ſo little in which the wonderful order and wiſe diſpoſition of nature do not ſhine forth.

Laſtly, all theſe treaſures of nature, ſo artfully contrived, ſo wonderfully propagated, ſo providentially ſupported throughout her three kingdoms, ſeem intended by the Creator for the ſake of man. Every thing may be made ſubſervient to his uſe, if not immediately, yet mediately; not ſo to that of other animals. By the help of reaſon man tames the fierceſt animals; purſues and catches the ſwifteſt; nay, he is able to reach even thoſe which lie hid in the bottom of the ſea.

By the help of reaſon, he increaſes the number of vegetables immenſely, and does that by art which nature left to herſelf, could ſcarcely effect. By ingenuity he obtains from vegetables whatever is convenient or neceſſary for food, drink, cloathing, medicine, navigation, and a thouſand other purpoſes.

He has found the means of going down into the abyſs of the earth, and almoſt ſearching its very bowels. With what artifice has he learned to get fragments from the moſt rocky mountains, to make the hardeſt ſtones fluid like water, to ſeparate the uſeful metal from the uſeleſs droſs, and to turn the fineſt ſand to ſome uſe! In ſhort, when we follow the ſeries of created things, and conſider how providentially one is made for the ſake of another, the matter comes to this, that all things are made for the ſake of man; and for this end more eſpecially, that he, by admiring the works of the Creator, ſhould extol his glory, and at once enjoy all thoſe things of which he ſtands in need, in order to paſs his life conveniently and pleaſantly.

Beſides general natural hiſtories, which we have here given a ſpecimen of, as thoſe of Pliny, &c. there are likewiſe particular ones, and thoſe of two kinds. The firſt, thoſe which only conſider one kind of things; ſuch as the Hiſtory of Shells, by Dr Liſter; of Fiſhes, by Willoughby; that of Birds, by the ſame; that of Plants, by Ray; thoſe of inſects, by Swammerdam and Mouffet; that of Animals, by Geſner; that of Foſſils, by Agricola, Mercatus, &c.

The ſecond, thoſe which conſider the ſeveral kinds of natural things found in particular countries or provinces: as, the Natural Hiſtory of Dauphine, by Chorier; the Natural Hiſtory of the Antilles, by F. Du Tertre, and M. Lonvillers De Poincy; that of Oxfordſhire and Staffordſhire, by Dr Plott; that of Lancaſhire, by Leigh; of Northamptonſhire, by Morton; that of the Weſtern Iſlands, by Martin, &c.

The natural hiſtory only of one particular place, is a ſubject very extenſive in its materials, and not to be ſet about without great care and circumſpection. Mr Boyle has favoured the world with a liſt of the heads under which to arrange things, and what to enquire after on ſuch an occaſion.

The general heads under which he comprehends the articles of this hiſtory are four; the things which regard to the heavens, the air, the waters and the earth.

To theſe general heads Mr Boyle imagines ſhould be added, inquiries into traditions in the country, of any thing relating to it, whether peculiar to it, or only more common there than elſewhere; and where theſe require learning or ſkill in the anſwerer, the utmoſt care is to be taken to put the people in a way to give their accounts in a ſatisfactory manner; for a falſe or bad account of any thing is always much worſe than no account at all.

This ſubject concerning the works of nature, a very ſmall part of which we have been able to touch upon, is of ſuch importance and dignity that if it were to be properly treated in all its parts, men would find wherewithal to employ almoſt all the powers of the mind: nay, time itſelf would fail before, with the moſt acute human ſagacity, we ſhould be able to diſcover the amazing œconomy, laws, and exquiſite ſtructure, even of the leaſt inſect, ſince, as Pliny obſerves, nature nowhere appears more herſelf than in her moſt minute works.

Animal Kingdom.

Summary as it is, however, the preceding view, as it were in a map, of the ſeveral parts of nature, their connections and dependencies, may at leaſt, perhaps, convey an uſeful leſſon, and ſuch an one as the beſt of us often need to have inculcated.

From a partial conſideration of things, we are very apt to criticiſe what we ought to admire; to look upon as uſeleſs what perhaps we ſhould own to be of infinite advantage to us, did we ſee a little farther; to be peeviſh where we ought to give thanks; and at the ſame time to ridicule thoſe who employ their time and thoughts in examining what we were (*i. e.* ſome of us moſt aſſuredly were) created and appointed to ſtudy. In ſhort, we are too apt to treat the Almighty worſe than a rational man would treat a good mechanic, whoſe works he would either thoroughly examine or be aſhamed to find any fault with. This is the effect of a partial conſideration of nature; but he who has the candour of mind and leiſure to look farther, will be inclined to wonder and adore, and even to cry out with the poet,

> How wond'rous is this ſcene! where all is form'd
> With number, weight, and meaſure! all deſign'd
> For ſome great end! where not alone the plant
> Of ſtately growth; the herb of glorious hue,
> Or food-full ſubſtance: not the labouring ſteed;
> The herd, and flock, that feed us; not the mine
> That yields us ſtores for elegance and uſe;
> The ſea that loads our table; and conveys
> The wanderer man from clime to clime; with all
> Thoſe rolling ſpheres, that from on high ſhed down
> Their kindly influence; not theſe alone,
> Which ſtrike ev'n eyes incurious; but each moſs,
> Each ſhell, each crawling inſect, holds a rank
> Important in the plan of Him who fram'd
> This ſcale of beings; holds a rank, which loſt
> Would break the chain and leave behind a gap
> Which nature's ſelf would rue. Almighty Being,
> Cauſe and ſupport of all things, can I view
> Theſe objects of my wonder, can I feel
> Theſe fine ſenſations, and not think of thee?
> Thou who doſt thro' th' eternal round of time,
> Doſt thro' th' immenſity of ſpace exiſt
> Alone, ſhalt thou alone excluded be
> From this thy univerſe? ſhall feeble man
> Think it beneath his proud philoſophy
> To call for thy aſſiſtance, and pretend
> To frame a world, who cannot frame a clod;—
> Not to know thee, is not to know ourſelves——
> Is to know nothing—nothing worth the care
> Of man's exalted ſpirit—All becomes,
> Without thy ray divine, one dreary gloom,
> Where lurk the monſters of fantaſtic brains,
> Order bereft of thought, uncaus'd effects,
> Fate freely acting, and unerring Chance.
> Where meanleſs matter to a chaos ſinks,
> Or ſomething lower ſtill: for without thee
> It crumbles into atoms void of force,
> Void of reſiſtance—It eludes our thought.
> Where laws eternal to the varying code
> Of ſelf love dwindle. Intereſt, paſſion, whim,
> Take place of right and wrong: the golden chain
> Of being melts away, and the mind's eye
> Sees nothing but the preſent. All beyond
> Is viſionary gueſs—is dream—is death.
>
> THOMSON

We ſhall add to this article the following deſcription of a muſeum: The windows ought to be in the two longeſt ſides of the building, that it may be equally lighted during the whole day.

On one wing of the muſeum muſt be placed eleven preſſes, with ſhelves ſupported on wooden brackets. Theſe preſſes are intended for containing the eleven following claſſes of the *mineral kingdom* (a kingdom which forms the original baſis of every thing pertaining to this globe: minerals have neither organization nor life), *viz.*

1. Waters.
2. Earths.
3. Sands.
4. Stones.
5. Salts.
6. Pyrites
7. Semimetals.
8. Metals.
9. Bitumens and ſulphurs.
10. Volcanic productions.
11. Petrifactions, foſſils, and *luſus naturæ*.

We at once perceive the advantage of ſuch an arrangement, where every thing is diſtinct and diſtributed in the manner moſt advantageous for the inſpection of the ſtudent. The preſſes muſt be provided with a wire grate, or covered with glaſs: and each of them muſt have a title on the cornice, indicating the claſs which it contains. Beſides this, each ſhelf in the preſs ought to have a ſmall title on the edge, ſpecifying the kind of ſubſtances which are placed on it; and theſe ſhould be kept in clear glaſs-bottles, well ſealed and furniſhed with proper titles alſo. In them are to be ſeen earths, clays, turfs, ochres, chalks, marls, lapis ollaris, and micaceous ſtones, calcareous or limeſtones, ſpars, congelations, ſtony reſidua, ſtalactites, alabaſter, gypſum or plaſter-ſtone, flints, rock ſtones, rock and mineral cryſtals, ſalts, and pyrites ſubject to effloreſcence, coals, and other bituminous bodies, lava, and the droſs of volcanoes. In the bottom of each preſs two ſpaces may be reſerved and furniſhed with a conſiderable number of ſmall ſemicircular ſhelves, where pieces much eſteemed, and in complete preſervation, may be placed by themſelves or on very ſmall pedeſtals; ſuch as tranſparent mineral ſalt. collections of coloured pyrites, the ſtone called the *Inca's* ſtone, beautiful ſpecimens of cobalt, biſmuth, zinc, antimony, ore of fluid quickſilver, and cinnabar in cryſtals; the whole properly titled and arranged according to their claſſes.

The preſs for *metals* ought to preſent us in the ſame order with ſelect and rare ſpecimens of the ores of white, green, &c. lead, the ore of nickel, collections of cryſtalliſed tin, the *flos-ferri*, beautiful needles of hematite, a powerful rough loadſtone, with ſome platina, the ſilky copper of China, and a collection of malachite; likewiſe virgin ſilver, in vegetation and red ſilver, together with a collection of golden ore. Theſe ſubſtances form a ſpectacle equally varied and inſtructive: in this department of her works, nature is as rich and brilliant as in the various kinds of ſtones.

The preſs for *bitumens* may in like manner contain ſpecimens of jet poliſhed on one ſide; amber of different colours (which when it is tranſparent, and contains inſects, ought to be poliſhed on the two oppoſite ſurfaces); a beautiful ſpecimen of ambergris, together with pieces of tranſparent red and yellow ſulphur.

In the preſs for *petrifactions* or for *foſſils*, we muſt likewiſe place, on ſemicircular ſhelves, the rareſt and the beſt preſerved pieces? ſuch as lilium lapideum madrepores, tranſparent belemnites, foſſil urchins, the articulated nautilus, cornua ammonis ſawed and poliſhed, hyſterolite, lapis lenticularis, gryphites calculi or bezoar, turquoiſes, loadſtones, gloſſopetræ; in ſhort all kinds of figured ſtones, and alſo petrified wood.

In the preſs for *ſtones*, which has a ſimilar apparatus of ſhelves, we ſee different kinds of cryſtals, and all the precious ſtones in their matrix. Thoſe which are detached and uncut are placed in caſes or watch-glaſſes: but thoſe which have been cut and ſet are to be put in a jewel-box or open caſe for rings. The ſame is to be obſerved with regard to pieces, cups, ciſterns or poliſhed plates of agate, cornelian, jade, ſardonyx, onyx, chalcedony, jaſper, porphyry, granite, lapis lazuli, marble, alabaſter, and Iceland cryſtal. Here likewiſe are to be placed the Bologna ſtone, the Labrador ſtone, the ſerpentine ſtone, talc, amianthus, zeolite, baſaltes, touch-ſtone, together with Egyptian and Engliſh flints. With regard to impreſſed petrifactions, large arborizations, and Florence ſtones, if they are in good preſervation: they ſhould be framed and ſuſpended by hooks on the pilaſters which connect the preſſes of the mineral kingdom. Theſe preſſes are of an uniform height; but their breadth is proportioned to the ſize or number of the materials compoſing the claſs which it contains, and they are ſupported as well as thoſe which are placed all around, on a cheſt of drawers breaſt high. Theſe drawers muſt correſpond to the preſſes above them, and contain ſubſtances of the ſame claſs. This methodical arrangement is a great help to the memory: becauſe it occaſionally ſupplies the place of a numbered catalogue, and becauſe in a great multitude of objects it is the only means of finding at once what we want.

In the mineral kingdom, theſe drawers are very uſeful for containing earths, belemnites, entroches, aſtroites, and other polymorphus foſſils, univalve, bivalve, and multivalve ſhells, poliſhed petrifactions of bones and pieces of wood, collections of marbles and poliſhed flints, collections of ſilex, ſands, and amber, together with pieces procured from the melting of ores, ſuch as regulus, droſs, &c. Some parts of the mineral kingdom, ſuch as the earths and certain ſtones, make not a brilliant figure in a muſeum; they are notwithſtanding the moſt ſcientific parts of it, and the moſt intereſting to thoſe who prefer the ſolid ſatisfaction of tracing nature in her moſt important productions, and her fundamental operations, to the empty ſpectacle of gaudy colours and agreeable figures.

Minerals in general require to be kept with great care, and ſo as not to be intermixed. Some of them, ſuch as the ſalts, eaſily diſſolve: and others, as the pyrites, are ſubject to effloreſcence, Vegetables and animals are likewiſe more or leſs liable to corruption; and to prevent this inconvenience, great pains muſt be taken in preſerving certain pieces which are ſubject to ſpeedy decay.

On the *ſecond* wing of the cabinet are to be placed ten preſſes, diſtributed like thoſe of the mineral kingdom, and intended for containing the ten following diviſions of the *vegetable kingdom*. Vegetables are organiſed bodies, but they poſſeſs not, like animals ſpontaneous motion or feeling.

1. Roots.
2. Barks.
3. Woods and ſtalks.
4. Leaves.
5. Flowers.
6. Fruits and ſeeds.
7. Paraſite plants, alſo agarics and muſhrooms.
8. The juices of vegetables; ſuch as balſams and ſolid reſins, reſinous, gums, and gums properly ſo called.
9. Extracted juices, ſugars, and dregs.
10. Marine plants, and plants growing on the ſhores of the ſea.

In this kingdom, the ſame order of preſſes, the ſame ſymmetry and arrangement, are to be obſerved as in the mineral kingdom. The ſemicircular ſhelves in the bottom of the preſſes are here very uſeful for containing in ſmall ſquare phials China varniſh, eſſential oils, and other peculiar aromatics, whether of Arabia or India; together with the roots of cumbou, mandragora, certain fruits either monſtrous or natural, which grow in the Eaſt Indies, and which the natives ripen in large bottles with narrow necks, preſerved in ſpirits, ſuch as the caſhew-nut, &c. Here likewiſe are placed a number of fruits, remarkable for their rarity or great ſize; as cocoa nuts, gourds, the fruit of the baſtard locuſt-tree, the fruit of the ſand-box-tree, banana figs, pine-apples, coloquintida apple, dogſbane, vegetable tumors or wens, and a branch of *bois de dentelle*, in which the three parts of the bark, eſpecially the *liber*, are diſtinctly ſeparated.

As the number of vegetables greatly exceeds that of minerals, we ſeldom put any thing in bottles but the dried parts of exotic plants, which are uſed either in medicine or in the arts, and thoſe likewiſe which we cultivate merely from curioſity. With regard to indigenous plants, an *herbal* is formed of land and ſea plants, paſted or laid between leaves of paper collected into the ſhape of a book, and arranged according to the ſyſtem of the beſt botaniſts, To make this herbal as convenient as poſſible, it is proper to put the dried plants between two folds of dry paper, and, arranging them according to their families, genera, and ſpecies, to pile them one one above another, either openly on the ſhelves or in large band-boxes. On the back of the band-boxes muſt be a title indicating the family, at the extremity another with the name of the genus, and on each leaf the name of the ſpecies which it contains: the paper muſt be looſe, that they may be changed at pleaſure. The drawers are uſeful partly for holding different kinds of woods with the bark, cut in ſuch a manner as that the grain and contexture of it may eaſily be diſtinguiſhed, and for containing a collection of the woods of both Indies in ſmall poliſhed pieces with proper titles. One part of the drawers has ſeveral diviſions within for the purpoſe of holding ſeeds; and a ſmall title is inſcribed on each of theſe diviſions.

Sea-weeds, and ſmall marine plants of an elegant ſhape, which from their colour and variety form agreeable pictures, may be framed and ſuſpended by hooks to the pilaſters of the preſſes. In the animal kingdom, particularly inſects, it is well known, are attended with irreparable devaſtations. Butterflies, Animal Kingdom. ſtill more than the moſt beautiful birds, are not only ſubject to deſtruction in this way, but are alſo expoſed to great danger from the rays of the ſun, either direct or reflected, which alter their colour, make them loſe all their ſplendor, and, in ſome ſpecies, render it impoſſible to diſtinguiſh them. In general, we cannot prevent the deſtruction of vegetables and animals, but by drying them as much as poſſible, or by putting them in prepared liquors, which muſt not be allowed to evaporate. But dried animals and vegetables require ſtill a greater care: a great multitude of inſects which are bred in the month of April feed upon them and deſtroy them internally before they are perceived: they ought to be carefully watched during the continuance of this plague, which is about five months. In like manner, the moiſture of winter and the heat of ſummer make it neceſſary that the preſſes of muſæums ſhould be kept carefully ſhut, except perhaps thoſe which front to the north. Beſides, the vapour of ſulphur in combuſtion will kill theſe deſtructive inſects either before or after they become perfect ones: the fumigations muſt be carefully performed during dry weather, and in a box made on purpoſe, into which only the ſpecimens attacked are introduced.

On the third wing of the cabinet are placed preſſes for containing the ten following diviſions of the *animal kingdom* (a kingdom which derived the ſubſtance neceſſary to its exiſtence either mediately or immediately from the vegetable kingdom.——Animals poſſeſs feeling and ſpontaneous motion.)

1. Lythophytes
2. Zoophytes.
3. Teſtaceous animals.
4. Cruſtaceous animals.
5. Inſects.
6. fiſhes.
7. Amphibious animals. reptiles, and oviparous quadrupeds.
8. Birds, with their neſts and eggs.
9. Viviparous quadrupeds.
10. Man.

In theſe preſſes the ſame external decoration and diſtribution may be obſerved as in the preceding ones.

The preſs for the *lythophytes* muſt be arranged in ſuch a manner as to preſent at one view the hiſtory of lithophytes, madreporæ, and coral either rough or ſtript of its covering; the whole placed on ſmall wooden pedeſtals, blackened or gilded. Corallines, as well as fuci, may be paſted on a bit of paper, and put into a frame: ſuch pictures, when ſuſpended by hooks to the outſide of the pilaſters, always attract the atteneion of the ſpectators. If we have a conſiderable collection of them, it will be neceſſary to make a kind of herbal of them.

The preſs for *zoophytes* contains ſponges, the marine jet d' eau, the penna marina, holothuriæ, and all thoſe ſubſtances which are called *animal plants*, molluſcæ, worms, &c. Theſe productions muſt be preſerved in rectified ſpirit of wine, which will be ſufficiently weakened by the water contained in them. Upon the ſides are ſea-ſtars, both prickly and ſmooth, with ſeveral rays, a Meduſa's head, &c.

The *teſtaceous* animals are preſerved in bottles among ſpirits. On the ſemicircular ſhelves at the bottom of the preſs are placed large ſhells, and ſmall ones with their marine covering.

The preſs for *cruſtaceous* animals conſiſts almoſt entirely of ſemicircular ſhelves; and contains crabs, cray-fiſh, &c. Small lobſters, ſquillæ, and all ſmall cruſtaceous animals, excepting the hermit crab, are put in frames.

Animal Kingdom.

Two kinds of inſects are found in the preſs deſtined for them. The firſt kind, after being dried, are put in ſmall wooden frames, which are varniſhed and glazed on two ſides, that we may have it in our power to examine the inſect on both ſides: of this kind are flies, mantes, beetles, butterflies with their nymphæ or chryſalides, &c. (Theſe animals form the moſt brilliant part of the cabinet, while the preſs for birds is the moſt ſtriking; but great pains muſt be uſed in their preſervation.) Other inſects, ſuch as graſhoppers, ſcolopendræ, ſcorpions, ſalamanders, ſpiders, tarantulas, caterpillars, and eſpecially all ſoft inſects, muſt be preſerved in ſpirits, and placed on ſemicircular ſhelves at the bottom of the preſs. Here alſo are depoſited honey-combs, waſps neſts, and branches furniſhed with the neſts of thoſe inſects which produce the gum-lac.

In the preſs for *fiſhes* are to be ſeen bottles containing foreign fiſhes, which are always ſent home in ſpirits. The ſoft fiſhes of our own country are preſerved in the ſame manner. The ſkin of large fiſhes, whether found in ſalt or freſh water, is taken off and paſted on a bit of paper: the two parts are ſometimes ſewed together, and the colours are renewed by means of varniſh. The flying fiſh muſt be ſuſpended about the top of the preſs; and armed fiſhes, with oſtracia, on the ſhelves below,

The preſs for *amphibious* animals contains, in bottles full of ſpirit of wine diluted with alum water, ſerpents, vipers, adders, frogs, toads, lizards, ſmall land or water turtles, and a ſmall tortoiſe with its ſhell. The lower ſhelves are furniſhed with a ſmall rattle-ſnake, a cameleon, a crocodile, a beaver, a ſea-lion, a ſea calf, &c.

The preſs for *birds* is filled with animals of that claſs both foreign and natives, ſtuffed and provided with glaſs eyes. The ſkin covered with the feathers may be preſerved perfect and dry by being fitted to a mould of tree-moſs, or filled with cotton and ſprinkled on the inſide with pepper, camphire, and corroſive ſublimate, to defend it from the attack of moths, grubs, wood lice, and dermeſtes. The ſpring and autumn are the beſt ſeaſons for this operation; the moulting-time is very improper, becauſe it is unfavourable to the beautiful colour and the preſervation of the feathers, which moreover are then full of blood. The birds, when thus prepared, and when the brain has been taken out, are then placed on their ſupports.—Some females may be placed in their neſts in the attitude of incubation; thoſe which are accuſtomed to perch may be placed on artificial trees: a wooden ſupporter covered with moſs, turf, or artificial reeds, may be given to thoſe which live among ſuch plants.—Swimming birds are placed on the lowermoſt ſhelves, which muſt be covered with pieces of mirror [illegible] gauze, in imitation of water. We muſt be careful to give each animal the moſt picture ſque attitude: to preſerve the proportions, together with the natural poſition of the legs, wings, head, body and feathers; to obſerve an equilibrium in thoſe which are at reſt, and to avoid it in thoſe which have a flying attitude.—We muſt characteriſe the animal, repreſent its manners,

diſpoſitions,

diſpoſitions, graces, boldneſs, or timidity. In ſhort, we muſt endeavour to expreſs that beautiful *tout enſemble* which gives the appearance of life and motion to the whole. The deception ought to be ſuch, that thoſe who examine the particulars of the collection may apply to each what was ſaid on another occaſion— *Nothing is dead, but all is alive.* Theſe obſervations on birds are equally applicable to the other animals; but all of them muſt be arranged in a methodical order, which poſſeſs the advantage neceſſary in ſuch collections of uniting pleaſure with inſtruction.

The lower ſhelves contain the eggs and neſts of birds; and a collection of feathers is made in a book in the ſame manner as an *herbal*.

The preſs for *quadrupeds* contains, preſerved in bottles, ſmall animals, ſuch as mice, rats, the opoſſum, &c. Other animals are ſtuffed, ſuch as the cat, the ſquirrel, the hedge hog, the porcupine, the armadillo, the Guinea pig, the wolf, the fox, the roe-buck, the hare, the dog, &c.

The preſs containing the *hiſtory of man* conſiſts of a complete myology, of a head ſeparately injected, of a brain and the organs of generation in both ſexes, of a neurology, an oſteology, embryos of all different ages, with their after births, monſtrous fœtuſes, and an Egyptian mummy. Here likewiſe are put beautiful anatomical pieces in wax or wood, and ſtony concretions extracted from the human body.

The preſervation of ſubjects in bottles with ſpirit of wine does not always ſucceed, becauſe they ſpoil as the ſpirit of wine evaporates, unleſs particular care be taken to examine the veſſels wherein they are contained, which requires time and pains, and is attended with expence. Mr Lewis Nicola, in the Philadelphia Tranſactions for the year 1771, recommends, after uſing the different methods pointed out by M. Reaumur of putting ſubjects intended for preſervation in bottles filled with ſpirit of wine, to wipe well the neck of the bottle, and put a layer of putty, two lines thick, over the piece of ſkin or bladder which covers it. The bottle is then reverſed in a wooden cup, which they fill with melted tallow, or with a mixture of tallow and wax to prevent the ſpirit of wine from evaporating.

The drawers under the preſſes of the *animal kingdom* contain ſmall detached parts of animals, ſuch as teeth, ſmall horns, jaw-bones, claws, beaks, nails, vertebræ, hairs, ſcales, balls of hair, and a collection of bones remarkable for blows, fractures, deformities, and diſeaſes.

To decorate a cabinet to the greateſt advantage, and to make one complete whole, the walls muſt be furniſhed throughout their whole extent. For this purpoſe the tops of the preſſes are commonly ornamented with ſhells of a very great ſize, foreign waſps-hives, the horn of a rhinoceros, an elephant's trunk, the horn of an unicorn, urns and buſts of alabaſter, jaſper, marble, porphyry, or ſerpentine ſtone. Here likewiſe are placed figures of antique bronze, large lythophytes, animals made of ſhells, bouquets made of the wings of [illegible] gourds cut into two, painted, and made into bowls, plates, vaſes, and as they are uſed by ſavages: little trunks of bark, books made of the leaves of the palm-tree, globes, ſpheres, &c. The multiplicity and ſingularity of the objects never fail to arreſt the attention of the ſpectator.

The circumference of the cabinet being furniſhed in the manner we have deſcribed, the floor may likewiſe be paved with different kinds of common ſtones which are ſuſceptible of a poliſh.

The ceiling, which muſt be very white, is divided into three ſpaces, furniſhed with hook and braſs wires. Here may be diſtributed in order different vegetable and animal productions, which are of too great a ſize to be contained in the preſſes; ſuch as,

1. The ſugar-cane, a branch of the palm-tree, together with that called the *Chineſe fan*, large cocoas both ſimple and with a double lobe, the leaf of the banana-tree, Indian and European ſticks, remarkable for the knots, tubercles, and ſpiral wreaths, which cover their whole length, a bamboo root divided longitudinally into two parts, and the different ſpecies of reed-canes.

2. The ſkins of large animals: alſo ſtuffed animals, ſuch as lizards, whether a crocodile or caiman and ſcaly lizard, a ſhark, a ſword-fiſh, a ſea-calf, a ſea-tortoiſe, large and long ſerpents, the horns of deer, wild goats, roe-bucks, and rein-deer.

3. The third ſpace is filled with Indian rackets, hammocks, dreſſes, and tufts of feathers; with calumets or pipes; with quivers, bows, and arrows; with head-pieces, caps with feathers, aprons, necklaces, Chineſe neceſſaries, fans made of the leaves of the palm tree, a gargoulette of Indoſtan, a Poliſh whip, Indian canoes, Chineſe muſical inſtruments, lances, weapons, Indian furniture and utenſils; and in ſhort, various curioſities from nations ancient and modern, if they can be found; various furniture and utenſils of different nations, ancient and modern.

As the great extent of a fine collection requires that there be no empty ſpace, ſtands may be placed in different parts of the room, eſpecially at the corners, for ſupporting large vertebræ, the head of a ſea cow, very large madrepores, or conſiderable collections either of rock chryſtal or of minerals.

In the middle of the room is placed a receptacle for ſhells, which is a large table or bureau with raiſed edges. The ſurface of this table is divided into 27 ſeparate caſes, of different ſizes, and proportioned to the 27 families of marine ſhells to be depoſited in them. Theſe diviſions are made with wood or paſteboard painted blue, and are ſometimes in the form of ſhelves; the bottom is covered with blue cotton or green ſattin, or, what is ſtill ſimpler, with white linen, ſufficiently rough to keep the ſhells in their place. In ſome cabinets, theſe ſhelves are covered with mirrors on all their different ſurfaces, which ſhows the objects double, and gives us an opportunity of viewing them on the two oppoſite ſides. In other cabinets the caſes for each family are diſtributed into a number of ſmaller diviſions, for containing the ſeveral ſpecies ſeparate from each other. The ſea-ſhells, contained in the receptacle for ſhells, are all cleaned and preſent, in the variety of their figure and colours, together with their inequality, an agreeable and enchanting picture, ſo much the more charming that it unites a methodical diſtribution to a ſymmetrical order. The upper part of this table is ſhut by a net-work of braſs wire covered with ſerge, or, what is ſtill better, by a glaſs frame, to defend the ſhells from duſt. We muſt not omit to mention, that in the middle of the table there is a long elevated ſquare box, containing land and river ſhells. From the middle of each compartment, or at each family of ſhells, ariſes a ſmall pyramidal wooden pillar, on the top of which is an horizontal piece of paſteboard, or ſort of ſign, denoting the kind of ſhells belonging to that diviſion. Each family is diſtinguiſhed from the adjoining one by thoſe kind of ornaments of ſilk called *caterpillars*. By means of the different tints, we perceive the limits and extent of each family in the ſame manner as the colours in a geographical map enable us to diſtinguiſh the ſeveral provinces of the ſame empire. An exhibition of this kind was to be ſeen from 1768 to 1774, in a muſeum belonging to the prince of Condé at Chantilly.

Under the table for ſhells, on the ſide of the windows, is a glazed cage, large enough to contain the ſkeletons of an animal belonging to each claſs, to wit, a fiſh, an amphibious animal, a reptile, a lizard, a bird, and a quadruped. When to theſe we can add, for the ſake of the comparative oſteology, the ſkeletons of the intermediate individuals of theſe animals, together with thoſe which make the neareſt approaches to man, ſuch as the *monkey* and the *bear*, we greatly increaſe both the pleaſure and inſtruction. Below this table are likewiſe placed the beſt books connected with the different branches of natural hiſtory, eſpecially ſuch as have illuminated plates. The difficulty of acquiring the moſt valuable objects, and of preventing their deſtruction when once acquired, obliges us to have recourſe to figures, in order to preſerve a repreſentation of them. This is an infallible method of communicating, not only to our cotemporaries, but alſo to poſterity, the diſcoveries of the age in which the work was compoſed. Here alſo may be depoſited the *herbal* and the collection of *feathers*, arranged in the form of books.

The ſpace above the door is furniſhed with a large frame, filled with the ſkins of rare fiſhes, which are dried, varniſhed, and paſted on paper.

The piers of the windows are furniſhed with one or two preſſes, which are provided with ſhelves, and contain different kinds of inſtruments employed in phyſics, ſuch as an air-pump, a burning mirror, a perſpective glaſs, a magnifier, a microſcope, a teleſcope, magnets both natural and artificial, &c.

On the ſemicircular ſhelves below are placed ſtones formerly uſed by ſavages for hatchets. Some curious pieces of lacker work, Indian pagodas, trinkets belonging to the ſavages of the north and to the Chineſe, which are made of ivory or yellow amber, or of coral mounted with gold, ſilver, porcelain-clay, *kricks* of Siam, and Turkiſh *cangiers*, which are a kind of poniards, Indian curioſities of ſilver, and the galians which the Turks and Perſians uſe in ſmoking tobacco and aloes.

The drawers under this preſs contain a collection of medals, china ink, lachrymatory phials, and the moſt beautiful engraved ſtones of Europe, or an impreſſion of them in wax or ſulphur, counters, cameos, antiques, taliſmans, ancient weights and meaſures, idols, urns, lamps, inſtruments of ſacrifice, and falſe jewels.

Laſt of all, the embraſures of the windows muſt be furniſhed with pictures of ſtone in connected pieces. Here likewiſe, as well as in the embraſures and pannels of the door, may be put tubes hermetically ſealed, containing rare reptiles preſerved in proper liquors.

The reader will by this time have ſome idea of the prodigious extent of the ſcience of natural hiſtory; ſo extenſive is it, indeed, that the longeſt life is far from being ſufficient to enable us to acquire a perfect knowledge of it: it is important beyond diſpute, becauſe its buſineſs is with the works of God. In all the articles connected with the preſent, as forming particular parts of it, and to which we refer, we have made great uſe of the works of the celebrated Linnæus, who it is well known arranged the three kingdoms into regular ſyſtems, of which botany is the moſt complete. The world in general ſeems to have been moſt diſſatisfied with the animal kingdom: he himſelf, in the courſe of a variety of editions, made many important alterations. Some men of conſiderable note, for example Buffon, have written on this ſubject without any regard to ſyſtematic arrangement. Dr Berkenhout's works on this part of ſcience are very uſeful; in a a particular manner, becauſe he tranſlates Latin names, &c. Bomare's new edition of his Natural Hiſtory, in 15 vols. octavo, a work of conſiderable importance, was publiſhed in 1791.

The moſt complete ſyſtem, however, of natural hiſtory which has been yet given to the public, is undoubtedly that of Linnæus, in his *Syſtema Naturæ*, of which a new and improved edition is actually publiſhing by —— Gmeling. A ſhort view of this elaborate work will, we preſume, not be unacceptable to the reader, as it will preſent him, in a very ſmall compaſs, an abſtract of whatever is at preſent known in the ſix firſt claſſes of natural hiſtory.

CLASS I. *Mammalia.*

Ord.	Gen.	Sp.
Primates	4	88
Bruta	7	25
Feræ	10	186
Glires	10	129
Pecora	8	90
Belluæ	4	25
Cete	4	14
7	47	557

CLASS II. *Aves.*

Ord.	Gen.	Sp.
Accipitres	4	271
Picæ	23	663
Anſeres	13	314
Grallæ	20	326
Gallinæ	10	129
Paſſeres	17	983
6	87	2686

CLASS III. *Amphibia.*

Ord.	Gen.	Sp.
Reptilia	4	147
Serpentes	6	219
2	10	366

CLASS IV.

Animal Kingdom.

Class IV. *Piſces.*

Ord.	Gen.	Sp.
Apodes	10	37
Jugulares	6	52
Thoracici	19	452
Abdominales	16	202
Branchioſtegi	10	[illegible]
Condropterygii	5	65
6	66	[illegible]

Class V. *Inſecta.*

Ord.	Gen.	Sp.
Coleoptera	55	4048
Hemyptera	14	1464
Lepidoptera	3	2600
Neuroptera	7	174
Hymenoptera	15	1239
Diptera	12	692
Aptera	15	679
7	121	10896

Class VI. *Vermes.*

Ord.	Gen.	Sp.
Inteſtina	21	[illegible]
Molluſca	31	[illegible]
Teſtacea	36	[illegible]
Zoophyta	15	[illegible]
Infuſoria	15	[illegible]
5	[illegible]	[illegible]

In the new French *Encyclopédie par ordre de Matières*, the editors promiſed to give a [illegible] of more than 18[illegible] plants. In Berkenhout's [illegible] laſt edition of his Synopſis, [illegible] that in Great Britain and Ireland there are about [illegible] ſpecies of mammalia, 250 of birds, 5[illegible] of the amphibious [illegible] inſects, 150 of fiſhes and [illegible] ſpecies of [illegible] in every claſs he is probably much within the number.

Natural Philoſophy

Natural Philoſophy, is commonly defined to be that art or ſcience which conſiders the powers and properties of natural bodies, and their mutual actions on one another. The province of moral philoſophy is the mind of man; its inquiries and reſearches are into the intellectual world. Natural philoſophy, on the other hand, is only concerned with the material part of the creation. The Moraliſt's buſineſs is to inquire into the nature of virtue, the cauſes and effects of vice, to propoſe remedies for it, and to point out the mode of attaining happineſs, which only can be the reſult of virtuous conduct. The Naturaliſt, on the contrary, has nothing to do with ſpirit; his buſineſs is ſolely about body or matter; and he ought to have a ſolid and accurate knowledge of all material ſubſtances, together with their affections and properties; and, if poſſible,, he is to inveſtigate the reaſons of ſuch and ſuch appearances.—Indeed, the firſt and principal part of this ſcience is to collect all the manifeſt and ſenſible appearances of things, and reduce them into a body of natural hiſtory. Philoſophy, it has often been ſaid, and it is even now very generally thought, to mean an inquiry into all the cauſes of things; but experience informs us, that though we are acquainted with a good number of effects, we can trace but few of their cauſes; ſo that philoſophy itſelf will really be found to be in general but a collection of facts. Still, however, it differs from natural hiſtory in its appropriated ſenſe; the buſineſs of which is only to obſerve the appearances of natural bodies ſeparately, and from theſe appearances to claſs them with other bodies: natural philoſophy goes farther, and recites the action of two or more bodies of the ſame or different kinds upon one another; and though it can never inveſtigate nor point out the cauſes of thoſe effects, whatever they are, yet, from mathematical reaſoning combined with experience, it can be demonſtrated, that in ſuch circumſtances ſuch effects muſt always take place. There are evidently two ways of making obſervations on the material world: the firſt is, when we view things nearly as they happen to turn up, without any deſign or intervention of our own; in which way, indeed, no great improvements can be expected in the art, becauſe chance having the direction, only exhibits occaſional or extemporary properties. The other method is, when, after a thorough acquaintance with bodies, we apply them to other bodies equally known, diligently attending to the reſult, and obſerving whether any thing new ariſes. Such ſeems to be in general the nature of our article; nor is it our intention to be much more particular at preſent. We muſt therefore refer our readers reſpectively to thoſe parts of the ſubject, reſpecting which they wiſh for more ſatisfaction and minuter details. The ancient and modern definitions of the word *philoſophy*, together with its origin, as well as the manner of philoſophiſing in former times as well as at preſent, with the gradual improvemement of ſcience, particularly natural, we ſhall introduce, we think, more properly under the words Philosophy and Physics. We need only add under the preſent article, what however is well known, that natural philoſophy was till lately divided only into four parts, commonly called the *four branches*, viz. 1. Mechanics; 2. Hydroſtatics; 3, Optics; and 4. Aſtronomy; and theſe again are ſubdivided into various parts. Modern diſcoveries have added, however, two more parts to the number, viz. magnetiſm and electricity, whoſe properties and effects, &c. have been wonderfully unfolded of late years.—It is remarkable, that in the Engliſh univerſities theſe two latter branches are never taken notice of in lecturing on natural philoſophy, the old diviſion being ſtill retained, without any mention of theſe two important articles. The reaſon may be, that they are only ſubject to experiment, and not yet reduced to mathematical reaſoning; which is the method of teaching philoſophy in one of theſe celebrated ſeminaries. Of theſe branches of this extenſive ſcience, it is not our intention to take even a general view in this place. We muſt

Naturalization
‖
Nature.

muſt therefore refer our readers to each particular article, where they will find them treated at conſiderable length.—See *Experimental Philoſophy*.

NATURALIZATION, in the Engliſh law, the act of naturalizing an alien, or putting him into the condition of a natural born ſubject, and intitling him to the rights and privileges thereof. But none can be naturalized unleſs they have received the ſacrament within one month before the bringing in of the bill, and taken the oaths of allegiance and ſupremacy in the preſence of the parliament. A perſon who is naturalized may have lands by deſcent, as heir at law, as well as obtain them by purchaſe; but he is diſabled from being a member of the privy council or parliament; or from holding offices, 7 Jac. I. cap. 2. 12 Will. III. cap 2. All children born out of the king's dominions, whoſe fathers were or are ſubjects of this kingdom at the time of their birth, are adjudged to be natural born ſubjects of this realm, except children of parents attainted of treaſon, or that are in the actual ſervice of a foreign prince at enmity with us, 4 Geo. II. cap. 21. Every foreign ſeaman, who in time of war ſerves two years on board an Engliſh ſhip, is *ipſo facto* naturalized, 13 Geo. II. cap. 3. And all foreign Proteſtants and Jews upon their reſiding ſeven years in any of the Britiſh colonies, without being abſent above two months at a time, or ſerving two years in a military capacity there, are upon taking the oaths naturalized to all intents and purpoſes, as if they had been born in this kingdom; and therefore are admiſſible to all ſuch privileges, and no other as Proteſtants or Jews born in this kingdom are intitled to. See Alien and Denizen.

In France, before the Revolution, naturalization was the king's prerogative; in England it is only done by act of parliament. In the former of thoſe places, before their government was overturned, Swiſs, Savoyards, and Scots, did not require naturalization, being reputed regnicoles, or natives.

NATURALS, among phyſicians, whatever naturally belongs to an animal, in oppoſition to non-naturals. See Non-naturals.

NATURE, according to Mr Boyle, has eight different ſignifications; it being uſed, 1. For the Author of nature, whom the ſchoolmen call *Natura Naturans*, being the ſame with God. 2 By the nature of a thing, we ſometimes mean its eſſence; that is, the attributes which make it what it is, whether the thing be corporeal or not; as when we attempt to define the nature of a fluid, of a triangle, &c. 3. Sometimes we confound that which a man has by nature with what accrues to him by birth; as when we ſay, that ſuch a man is noble by nature. 4. Sometimes we take nature for an internal principle of motion; as when we ſay, that a ſtone by nature falls to the earth. 5. Sometimes we underſtand, by nature, the eſtabliſhed courſe of things. 6. Sometimes we take nature for an aggregate of powers belonging to a body, eſpecially a living one; in which ſenſe phyſicians ſay, that nature is ſtrong, weak, or ſpent; or that, in ſuch or ſuch diſeaſes, nature left to herſelf will perform the cure. 7. Sometimes we uſe the term *nature* for the univerſe, or whole ſyſtem of the corporeal works of God; as when it is ſaid of a phœnix, or chimera, that there is no ſuch thing in nature. 8. Sometimes too, and that moſt commonly, we expreſs by the word *nature* a kind of ſemi-deity, or other ſtrange kind of being.

Nature
‖
Naval.

If, ſays the ſame philoſopher, I were to propoſe a notion of nature leſs ambiguous than thoſe already mentioned, and with regard to which many axioms relating to that word may be conveniently underſtood, I ſhould firſt diſtinguiſh between the univerſal and the particular nature of things. Univerſal nature I would define to be the aggregate of the bodies that make up the world in its preſent ſtate, conſidered as a principle; by virtue whereof they act and ſuffer, according to the laws of motion preſcribed by the Author of all things. And this makes way for the other ſubordinate notion; ſince the particular nature of an individual conſiſts in the general nature applied to a diſtinct portion of the univerſe; or, which is the ſame thing, it is a particular aſſemblage of the mechanical properties of matter, as figure, motion, &c.

Kingdoms of Nature. See Kingdoms.

Conduct or operations of Nature. See *Natural Hiſtory*.

NAVA (anc geog.) Tacitus; a river of Belgica, which runs north-eaſt into the left or weſt ſide of the Rhine. Now the *Nahe*, riſing at the village of Naheweiler, on the borders of the biſhopric of Triers, running through the Lower Palatinate, the duchy of Simmeren, by the ſmall town of Bing, into the Rhine.

NAVAL, ſomething relating to a ſhip; whence,

Naval Architecture. See *Ship-Building*.

Naval-Camp, in antiquity, a fortification, conſiſting of a ditch and parapet on the land ſide, or a wall built in the form of a ſemicircle, and extended from one point of the ſea to another. This was ſometimes defended with towers, and beautified with gates, through which they iſſued forth to attack their enemies. Homer has left us a remarkable deſcription of the Grecian fortifications of this ſort, in the Trojan war, beginning at v. 436. Iliad *ν*.

> Then, to ſecure the camp and naval powers,
> They rais'd embattled walls with lofty tow'rs:
> From ſpace to ſpace were ample gates around,
> For paſſing chariots; and a trench profound,
> Of large extent, and deep in earth below
> Strong piles infix'd ſtood adverſe to the foe.
>
> Pope's *Tranſl.*

Towards the ſea, or within it, they fixed great pales of wood, like thoſe in their artificial harbours; before theſe the veſſels of burden were placed in ſuch order, as that they might be inſtead of a wall, and give protection to thoſe within; in which manner Nicias is reported by Thucydides to have encamped himſelf: but this ſeems only to have been practiſed when the enemy was thought ſuperior in ſtrength, and raiſed great apprehenſions of danger in them. When their fortifications were thought ſtrong enough to defend them from the aſſaults of enemies, it was frequent to drag their ſhips to ſhore, which the Greeks called [illegible], the Romans *ſubducere*. Around the ſhips the ſoldiers diſpoſed their tents, as appears every where in Homer: but this ſeems only to have been practiſed in winter, when their enemy's fleet was laid up and could not aſſault them; or in long ſieges, and when they lay in no danger from their enemies by ſea;

as in the Trojan war, where the defenders of Troy never once attempted to encounter the Grecians in a ſea-fight.

The adjacent places were uſually filled with inns and ſtews well ſtocked with females, that proſtituted themſelves to the mariners, merchants, and artiſicers of all ſorts who flocked thither in great numbers; this, however, appears to have happened only in times of peace.

Naval Crown, among the ancient Romans, a crown adorned with figures of prows of ſhips, conferred on perſons who in ſea-engagements firſt boarded the enemy's veſſel. See Crown.

Naval Engagement. See Tactics *(Naval)*.

Naval Stores, comprehend all thoſe particulars made uſe of, not only in the navy, but in every other kind of navigation; as timber and iron for ſhipping, pitch, tar, hemp, cordage, ſail-cloth, gunpowder, ordnance, and fire-arms of every ſort, ſhip-chandlery wares, &c.

Naval-Tactics, the military operations of fleets. See Tactics *(Naval.)*.

NAVAN, a borough, poſt, and fair town of Ireland, in the county of Meath and province of Leinſter; ſituated about 23 miles north-weſt of Dublin, on the river Boyne. It conſiſts of two chief ſtreets, which interſect each other at right angles.—The Tholſel, or town-houſe, is a handſome ſtone building. This place was formerly in great repute, and walled in by Hugh de Lacy. An abbey for regular canons, dedicated to the Virgin Mary, was erected here; but whether antecedent to the end of the 12th century is not certain: about that period, however, it was either founded or re-edified by Joceline de Angulo or Nangle. In the burial-ground are the remains of many ancient tombs, with figures in alto relievo; and the preſent barrack for one troop of horſe is built on the ſite of the abbey. Navan ſends two members to parliament; patronage in the Preſton family. Here are four fairs held.

NAVARRE, a province of Spain, part of the ancient kingdom of Navarre, erected ſoon after the invaſion of the Moors; and is otherwiſe called *Upper Navarre*, to diſtinguiſh it from Lower Navarre belonging to the French. It is bounded on the ſouth and eaſt by Arragon, on the north by the Pyrenees, and on the weſt by Old Caſtile and Biſcay; extending from ſouth to north about 80 miles, and from eaſt to weſt about 75. It abounds in ſheep and cattle; game of all kinds, as boars, ſtags, and roebucks; and in wild fowl, horſes, and honey; yielding alſo ſome grain, wine, oil, and a variety of minerals, medicinal waters, and hot baths. Some of the ancient chiefs of this country were called *Solrarbores*, from the cuſtom, as it is ſuppoſed which prevailed among ſome of thoſe free nations of chooſing and ſwearing their princes under ſome particular tree. The name of the province is ſuppoſed to be a contraction of *Nava Erria*, ſignifying, in the language of the Vaſcones, its ancient inhabitants, "a land of valleys." —For the particulars of its hiſtory, ſee the article Spain.

Navarre (Peter), an officer of eminence in the 16th century, and particularly celebrated for his dexterity in the directing and ſpringing of mines. He was a native of Biſcay, and of low extraction. According to Paul Jove, who affirms that he had an account of the matter from his own mouth, he was firſt a ſailor; but being diſguſted with that employment, he ſought his fortune in Italy, when poverty compelled him to become footman to the cardinal of Arragon. He afterwards inliſted himſelf a ſoldier in the Houſtine army; and having ſerved there for ſome time, went to ſea again, and diſtinguiſhed himſelf by his courage. The reputation of his valour having reached the ears of Gonſalvo de Cordoue, this general employed him in the war againſt Naples, and raiſed him to the rank of a captain. Having contributed greatly to the taking of that city by very opportunely ſpringing a mine, the emperor rewarded him for this ſignal ſervice with the earldom of Alveto, ſituated in that kingdom, and gave him the title of *count of Navarre*. Having the command of a naval expedition againſt the Moors in Africa, he was at firſt very ſucceſsful, and took poſſeſſion of Oran, Tripoli, and ſome other places; but being afterwards ſhipwrecked on the iſland of Gerbes, the great heats and the Mooriſh cavalry deſtroyed a part of his army. Our hero was equally unfortunate in Italy: He was made priſoner at the famous battle of Ravenna, in 1512, and languiſhed in France for the ſpace of two years. When finding that the king of Spain, who had been prejudiced againſt him by his courtiers, would do nothing towards his ranſom, he went into the ſervice of Francis I. who gave him the command of twenty companies of infantry, conſiſting of Gaſcons, Biſcayans, and the inhabitants of the Pyrenee mountains. He diſtinguiſhed himſelf in ſeveral ſucceſsful expeditions, until the year 1522, when having been ſent to the relief of the Genoeſe, he was taken by the Imperialiſts. They conducted him to Naples, where he remained a priſoner for three years in the caſtle of Œuf. From this confinement he was releaſed by the treaty of Madrid, and afterwards fought at the ſiege of Naples under Laulric in 1528: but being again made priſoner at the unfortunate retreat from Averſa, he was conducted a ſecond time to the caſtle of Œuf. Here the prince of Orange having, by order of the emperor, cauſed ſeveral perſons of the *Angevine* faction to be beheaded, our hero would undoubtedly have ſuffered the ſame fate, if the governor, ſeeing his diſtreſſed ſituation, and feeling for the misfortunes of ſo great a man, had not ſaved him the ſhame of this laſt puniſhment by allowing him to die a natural death. Others pretend that he was ſtrangled in his bed, having arrived at a very advanced age. Paul Jove and Philip Thomaſini have written his life. This laſt informs us, that he was of a tall ſize, had a ſwarthy countenance, black eyes, beard, and hair. A duke of Seſſa, in the laſt century being deſirous to honour his memory and that of the mareſhal de Lautree, cauſed a monument to be erected to each of them in the church of Sainte-Marie-le-Neuve at Naples, where they had been interred without any funeral honours.

Navarre (furnamed Martin Azpilcueta), becauſe he was born in the kingdom which bears that name, ſucceſſively profeſſor of juriſprudence at Toulouſe, Salamanca, and Coimbra, was conſulted from all quarters as the oracle of law. For a part of his knowledge he was indebted to the ſchools of Cahors and Toulouſe, in which he had ſtudied. His friend Barthelimi Carewza, a Dominican, and archbiſhop of Toledo, having been charged with hereſy by the court of inquiſition at Rome, Navarre ſet out at the age of 80 years to defend him. Pius V. appointed him aſſeſſor to cardinal Francis Alciat, vice-penetentiary. Gregory XIII. never paſſed his gate without ſending for him; and ſometimes would converſe with him for an hour together on the ſtreet: he even deigned to viſit him, accompanied by ſeveral cardinals. Theſe honours did not render him more haughty. His character became ſo eminent, that even in his own time the greateſt encomium that could be paid to a man of learning was to ſay that he was a *Navarre:* this name thus included the idea of erudition, as that of Roſcius formerly marked an accompliſhed comedian. Azpilcueta was the oracle of the city of Rome, and of the whole Chriſtian world. For the influence which he had acquired, he was indebted not only to his knowledge, but alſo to his probity and virtue. Faithful to the duties which the church preſcribed, his temperance and frugality preſerved to him a vigorous conſtitution; and at a very advanced age his genius was equal to the ſevereſt ſtudy. His ſavings enabled him to give liberal aſſiſtance to the poor. His charities, indeed, were ſo great, that his mule, it is ſaid, would ſtop as ſoon as ſhe perceived a beggar. He died at Rome in 1586, at the age of 92. His works were collected and printed in 6 vols folio at Lyons in 1597, and at Venice in 1602. They diſplay more learning than judgement, and are now very ſeldom conſulted. Navarre was uncle by the mother's ſide to St Francis of Sales. See SALES.

NAUCLERUS (John), deſcended of a noble family of Suabia, was provoſt of the church of Suringia, and profeſſor of law in the univerſity of that city.—His original name was *Vergeau;* but this name, which in German ſignifies "ſailor," he changed into Nauclerus, a word of the ſame ſignification in Greek.—He was alive in 1501. We have from him a Latin Chronicle from Adam to the year 1500, of which Baſelius wrote a continuation down to 1514, and Surius to 1564. It poſſeſſes greater accuracy than any hiſtorical compilation which had appeared prior to his time; but ſtill it is only a compilation. It is chiefly valued for what regards the occurrences of the 15th century. It was printed at Cologne in folio in 1564 and 1579.

NAUCRARI, among the Athenians, was the name given to the chief magiſtrates of the Δημοι, "boroughs or townſhips," called Ναυκραριαι; becauſe each was obliged, beſides two horſemen, to furniſh out one ſhip for the public ſervice.

NAUCRATES, a Greek poet, who was employed by Artemiſia to write a panegyric upon Mauſolus.—An orator who endeavoured to alienate the cities of Lycia from the intereſt of Brutus.

NAUCRATIS, a city of Egypt on the left ſide of the Canopic mouth of the Nile. It was celebrated for its commerce, and no ſhip was permitted to land at any other place, but was obliged to ſail directly to the city there to depoſit its cargo. It gave birth to Athenæus.

NAUCRATITES NOMOS (anc. geog.), Pliny; a diviſion of the Delta, ſo called from the town *Naucratis;* though Ptolemy comprizes it under the Nomos Saites.

NAUCYDES, a ſtatuary who lived about four centuries before the Chriſtian era.

NAUDE (Gabriel), was deſcended of a reputable family, and born at Paris, February 12th 1600.—His parents obſerving his fondneſs for reading and inclination to letters, reſolved to breed him in that way; and accordingly ſent him to a religious community, to learn the firſt rudiments of grammar and the principles of Chriſtianity. Thence he was removed to the univerſity; where he applied himſelf with great ſucceſs to claſſical learning; and having learned philoſophy, was created maſter of arts very young.—As ſoon as he had finiſhed his courſe in philoſophy, he remained ſome time at a ſtand what profeſſion to chooſe, being adviſed by his friends to divinity; but his inclination being more turned to phyſic, he fixed at length upon that faculty. However, this choice did not prevent him from indulging his genius in other branches of learning: in reality, the plan of his ſtudies was very extenſive, ſuited to his comprehenſive talents and indefatigable induſtry: and he ſoon diſtinguiſhed himſelf therein ſo much, that Henry de Meſmes, preſident à mortier, hearing his character, made him keeper of his library, and took him into his family. Naude was the more pleaſed with this poſt, as it gave him an opportunity of gratifying his bookiſh taſte in general, and at the ſame time furniſhed him both with means and leiſure to improve himſelf as he could wiſh, in the ſcience which he had embraced in particular. He quitted it in 1626, in order to go to Padua to perfect himſelf therein: but he did not continue long in that univerſity, the death of his father and his domeſtic affairs calling him back to Paris before the expiration of the year.

In 1628 the faculty of phyſic appointed him to make the cuſtomary diſcourſe on the reception of licentiates; which performance entirely anſwered their expectations from him, and was made public. In 1631, Cardinal Bagni made him his librarian and Latin ſecretary, and carried him with him to Rome in the ſpring of that year. Naude continued in this ſervice till the death of the cardinal, which happened July 24. 1641; and in the interim made an excurſion to Padua, to take his doctor of phyſic's degree, in order to ſupport with a better grace the quality with which he had been honoured by Louis XIII. who had made him his phyſician. The ceremony of this appointment was performed March 25. 1633, and we have the ſpeech he pronounced on the occaſion. After the death of his patron, he had thoughts of returning to France; but was detained in Italy by ſeveral advantageous offers made to him by perſons of conſideration in that country. Among theſe he preferred thoſe of Cardinal Barberini, and cloſed with his eminence. However, as ſoon as Cardinal Richelieu ſent for him to be his librarian, he immediately returned to Paris; but he happened not to be long in the ſervice of the prime miniſter, if it be true that he arrived at Paris in march 1642, ſince Cardinal Richelie died in December following; notwithſtanding, he ſucceeded to the like poſt under Mazarine, for whom he formed a moſt rich library, which he raiſed from the firſt volume in the ſpace of ſeven years to the number of 40,000.

His deſign was nearly completed before the Cardinal gave him two ſmall benefices, a canonry of Verdun and the priory of Artige in the Limoſin: and we know how much this ungeneroſity affected him, from a letter of Patin to Charles Spon, dated March 22. 1648, where he writes thus of our librarian: "I have ſeen one thing in him which I am very ſorry for; eſpecially as I have known him along hitherto at a great diſtance from ſuch a diſpoſition: it is, that he begins to complain of his fortune, and of his maſter's avarice, from whom he had never received any more than 1200 livres a year in benefices; not forbearing to declare, that his life was ſacrificed for too ſmall a matter. I think (continues Patin) what grieves him is, the apprehenſion of dying before he has raiſed ſomething for his brothers and his nephews, of whom he has a great number." However that be, Naude had the grief to ſee this library, which he had collected with ſo much pains and care, totally diſperſed. Upon the diſgrace of Mazarine it was ſold: and Patin, in a letter of March 5. 1651, obſerves, that Naude had bought all the books in phyſic for 3500 livres. Chriſtina queen of Sweden, who ſet herſelf to draw into her dominions all the literati of Europe, procured a propoſal to be made to Naude of being her library keeper: and as he was then out of all employ, he accepted the propoſal, and went to Cop.— But he ſoon grew out of humour with his reſidence in Sweden: the manners of the people, ſo very different from his, gave him great diſguſt; and ſeeing France become more quiet than it had been. he reſolved to return. Accordingly he quitted Sweden loaded with preſents from the queen, and ſeveral perſons of diſtinction: but the fatigue of the journey threw him into a fever, which obliged him to ſtop at Abbeville; and he died there July 29. 1653.

As to his character, he was very prudent and regular in his conduct, ſober, never drinking any thing but water. Study was his principal occupation, and he was indeed a true *Helluo librorum;* ſo that he underſtood them perfectly well. He ſpoke his mind with great freedom, and that freedom ſometimes ſhowed itſelf upon religious ſubjects, in ſuch a manner as might have occaſioned ſome diſadvantageous thoughts of him; but the Chriſtian ſentiments in which he died left room to believe that his heart was never corrupted, and had no ſhare in the free expreſſions which ſometimes eſcaped from him; eſpecially in the philoſophical railleries which paſſed ſometimes between him, Guy Patin, and Gaſſendi. He wrote a great number of books, a catalouge of which may be ſeen in Niceron's Memoires, tom. ix. Voltaire ſays, that "of all his books, the *Apologie des grands Homes accuſes de Magie* is almoſt the only one which continues to be read."

NAVE, in architecture, the body of a church, where the people are diſpoſed, reaching from the balluſter, or rail of the door, to the chief choir. Some derive the word from the Greek ναος, a temple;" and others from ναυς, "a ſhip," by reaſon the vault or roof of a church bears ſome reſemblance to a ſhip.

NAVEL, in anatomy, the centre of the lower part of the abdomen; being that part where the umbilical veſſels paſſed out of the placenta of the mother. See Anatomy, p. 725.

Navel-Wort in botany. See Cotyledon.

NAVEW, in botany. See Brassica, of which it is a ſpecies.

NAVIGATION.

IS the art of conducting or carrying a ſhip from one port to another.

HISTORY.

The poets refer the invention of the art of navigation to Neptune, ſome to Bacchus, others to Hercules, others to Jaſon, and others to Janus, who is ſaid to have made the firſt ſhip. Hiſtorians aſcribe it to the Æginets, the Phœnicians, Tyrians, and the ancient inhabitants of Britain. Some will have it, the firſt hint was taken from the flight of the kite; others, as Oppian, *De piſcibus*, lib. 1.) from the fiſh called *nautilus:* others aſcribe it to accident.—Scripture refers the origin of ſo uſeful an invention to God himſelf, who gave the firſt ſpecimen thereof in the ark built by Noah under his direction. For the raillery the good man underwent on account of his enterpriſe ſhows evidently enough the world was then ignorant of any thing like navigation, and that they even thought it impoſſible.

However, profane hiſtory repreſents the Phœnicians, eſpecially thoſe of their capital Tyre, as the firſt navigators; being urged to ſeek a foreign commerce by the narrowneſs and poverty of a ſlip of ground they poſſeſſed along the coaſts; as well as by the conveniency of two or three good ports, and by their natural genius to traffic. Accordingly, Lebanon, and the other neighbouring mountains, furniſhing them with excellent wood for ſhip-building, in a ſhort time they were maſters of a numerous fleet; and conſtantly hazarding new navigations, and ſettling new trades, they ſoon arrived at an incredible pitch of opulency and populouſneſs: inſomuch as to be in a condition to ſend out colonies, the principal of which was that of Carthage; which keeping up their Phœnician ſpirit of commerce, in time not only equalled Tyre itſelf, but vaſtly ſurpaſſed it; ſending its merchant-fleets through Hercules's pillars, now the ſtraits of Gibraltar, along the weſtern coaſts of Africa and Europe; and even, if we believe ſome authors, to America itſelf.

Tyre, whoſe immenſe riches and power are repreſented in ſuch lofty terms both in ſacred and profane authors, being deſtroyed by Alexander the Great, its navigation and commerce were transferred by the conqueror to Alexandria, a new city, admirably ſituated for thoſe purpoſes; propoſed for the capital of the empire of Aſia, which Alexander then meditated.

And thus aroſe the navigation of the Egyptians; which was afterwards ſo cultivated by the Ptolemies, that Tyre and Carthage were quite forgotten.

Egypt being reduced into a Roman province after the battle of Actium, its trade and navigation fell into the hand of Auguſtus; in whoſe time Alexandria was only inferior to Rome: and the magazines of the capital of the world were wholly ſupplied with merchandizes from the capital of Egypt.

At length, Alexandria itſelf underwent the fate of Tyre and Carthage; being ſurpriſed by the Saracens, who, in ſpite of the emperor Heraclius, overſpread the northern coaſts of Africa, &c. whence the merchants being driven, Alexandria has ever ſince been in a languiſhing ſtate, though it ſtill has a conſiderable part of the commerce of the Chriſtian merchants trading to the Levant.

The fall of Rome and its empire drew along with it not only that of learning and the polite arts, but that of navigation; the barbarians, into whoſe hands it fell, contenting themſelves with the ſpoils of the induſtry of their predeceſſors.

But no ſooner were the more brave among thoſe nations well ſettled in their new provinces; ſome in Gaul, as the Franks; others in Spain, as the Goths; and others in Italy, as the Lombards; but they began to learn the advantages of navigation and commerce, and the methods of managing them, from the people they ſubdued; and this with ſo much ſucceſs, that in a little time ſome of them became able to give new leſſons, and ſet on foot new inſtitutions for its advantage. Thus it is to the Lombards we uſually aſcribe the invention and uſe of banks, book-keeping, exchanges, rechanges, &c.

It does not appear which of the European people, after the ſettlement of their new maſters, firſt betook themſelves to navigation and commerce.—Some think it began with the French; though the Italians ſeem to have the juſteſt title to it; and are accordingly ordinarily looked on as the reſtorers thereof, as well as of the polite arts, which had been baniſhed together from the time the empire was torn aſunder. It is the people of Italy then, and particularly thoſe of Venice and Genoa, who have the glory of this reſtoration; and it is to their advantageous ſituation for navigation they in great meaſure owe their glory. In the bottom of the Adriatic were a great number of marſhy iſlands, only ſeparated by narrow channels, but thoſe well ſcreened, and almoſt inacceſſible, the reſidence of ſome fiſhermen, who here ſupported themſelves by a little trade of fiſh and ſalt, which they found in ſome of theſe iſlands. Thither the Veneti, a people inhabiting that part of Italy along the coaſts of the Gulph, retired, when Alaric king of the Goths, and afterwards Attila king of the Huns, ravaged Italy.

Theſe new iſlanders, little imagining that this was to be their fixed reſidence, did not think of compoſing any body politic; but each of the 72 iſlands of this little Archipelago continued a long time under its ſeveral maſters, and each made a diſtinct commonwealth. When their commerce was become conſiderable enough to give jealouſy to their neighbours, they began to think of uniting into a body. And it was this union firſt begun in the ſixth century, but not completed till the eighth, that laid the ſure foundation of the future grandeur of the ſtate of Venice. From the time of this union, their fleets of merchantmen were ſent to all the parts of the Mediterranean; and at laſt to thoſe of Egypt, particularly Cairo, a new city, built by the Saracen princes on the eaſtern banks of the Nile, where they traded for their ſpices and other products of the Indies. Thus they flouriſhed, increaſed their commerce, their navigation, and their conqueſts on the terra firma, till the league of Cambray in 1508, when a number of jealous princes conſpired to their ruin; which was the more eaſily effected by the diminution of their Eaſt India commerce, of which the Portugueſe had got one part and the French another. Genoa, which had applied itſelf to navigation at the ſame time with Venice, and that with equal ſucceſs, was a long time its dangerous rival, diſputed with it the empire of the ſea, and ſhared with it the trade of Egypt and other parts both of the eaſt and weſt.

Jealouſy ſoon began to break out; and the two republics coming to blows, there was almoſt continual war for three centuries before the ſuperiority was aſcertained; when, towards the end of the 14th century, the battle of Chioza ended the ſtrife; the Genoeſe, who till then had uſually the advantage, having now loſt all; and the Venetians, almoſt become deſperate, at one happy blow, beyond all expectation, ſecured to themſelves the empire of the ſea, and ſuperiority in commerce.

About the ſame time that navigation was retrieved in the ſouthern parts of Europe, a new ſociety of merchants was formed in the north, which not only carried commerce to the greateſt perfection it was capable of till the diſcovery of the Eaſt and Weſt Indies, but alſo formed a new ſcheme of laws for the regulation thereof, which ſtill obtain under the names of *Uſes and Cuſtoms of the Sea*. This ſociety is that famous league of the Hanſe-towns, commonly ſuppoſed to have begun about the year 1164. See *Hanse-Towns*.

For the modern ſtate of navigation in England, Holland, France, Spain, Portugal, &c. See Commerce, Company, &c.

We ſhall only add, that, in examining the reaſons of commerce's paſſing ſucceſſively from the Venetians, Genoeſe and Hanſe towns, to the Portugueſe and Spaniards, and from theſe again to the Engliſh and Dutch, it may be eſtabliſhed as a maxim, that the relation between commerce and navigation, or, if we may be allowed to ſay it, their union is ſo intimate, that the fall of the one inevitably draws after it that of the other; and that they will always either flouriſh or dwindle together. Hence ſo many laws, ordinances ſtatutes, &c. for its regulation; and hence particularly that celebrated act of navigation, which an eminent foreign author calls the *palladium* or *tutelar deity of the commerce of England*; which is the ſtanding rule, not only of the Britiſh among themſelves, but alſo of other nations with whom they traffic.

The art of navigation hath been exceedingly improved in modern times, both with regard to the form of the veſſels themſelves, and with regard to the methods of working them. The uſe of rowers is now entirely ſuperſeded by the improvements made in the formation of the ſails, rigging, &c. by which means the ſhips can not only ſail much faſter than formerly, but can tack in any direction with the greateſt facility. It is alſo very probable that the ancients were neither ſo well ſkilled in finding the latitudes, nor in ſteering their veſſels in places of difficult navigation, as the moderns. But the greateſt advantage which the moderns have over the ancients is from the mariner's compaſs, by which they are enabled to find their way with as great facility in the midſt of an immeaſurable ocean, as the ancients could have done by creeping along the coaſt, and never going out of ſight of land. Some people indeed contend, that this is no new invention, but the ancients were acquainted with it. They ſay, that it was impoſſible for Solomon to have ſent ſhips to Ophir, Tarſhiſh, and Parvaim, which laſt they will have to be *Peru*, without this uſeful inſtrument. They inſiſt that it was impoſſible for the ancients to be acquainted with the attractive virtue of the magnet, and to be ignorant of its polarity. Nay, they affirm, that this property of the magnet is plainly mentioned in the book of Job, when the load ſtone is mentioned by the name of *topaz*, or *the ſtone that turns itſelf*: But it is certain, that the Romans, who conquered Judea, were ignorant of this inſtrument, and it is very improbable, that ſuch an uſeful invention, if once it had been commonly known to any nation, would have been forgot, or perfectly concealed from ſuch a prudent people as the Romans, who were ſo much intereſted in the diſcovery of it.

Among thoſe who do agree that the mariner's compaſs is a modern invention, it hath been much diſputed who was the inventor. Some give the honour of it to Flavio Gioia of Amalfi in Campania*, who lived about the beginning of the 14th century; while others ſay that it came from the eaſt, and was earlier known in Europe. But, at whatever time it was invented, it is certain, that the mariner's compaſs was not commonly uſed in navigation before the year 1420. In that year the ſcience was conſiderably improved under the auſpices of Henry duke of Viſco, brother to the king of Portugal. In the year 1485, Roderic and Joſeph, phyſicians to John II. king of Portugal, together with one Martin de Bohemia, a Portugueſe, native of the iſland of Fayal, and ſcholar to Regiomontanus, calculated tables of the ſun's declination for the uſe of ſailors, and recommended the aſtrolabe for taking obſervations at ſea. Of the inſtructions of Martin, the celebrated Chriſtopher Columbus is ſaid to have availed himſelf, and to have improved the Spaniards in the knowledge of the art; for the further progreſs of which a lecture was afterwards founded at Seville by the emperor Charles V.

* See Mariner's Compaſs.

The diſcovery of the variation is claimed by Columbus, and by Sebaſtian Cabot. The former certainly did obſerve this variation without having heard of it from any other perſon, on the 14th of September 1492, and it is very probable that Cabot might do the ſame. At that time it was found that there was no variation at the Azores, where ſome geographers have thought proper to place the firſt meridian; though it hath ſince been obſerved that the variation alters in time.—The uſe of the croſs-ſtaff now began to be introduced among ſailors. This ancient inſtrument is deſcribed by John Werner of Nuremberg, in his annotations on the firſt book of Ptolemy's Geography, printed in 1514. He recommends it for obſerving the diſtance between the moon and ſome ſtar, in order thence to determine the longitude.

At this time the art of navigation was very imperfect on account of the inaccuracies of the plane chart, which was the only one then known, and which, by its groſs errors, muſt have greatly miſled the mariner, eſpecially in voyages far diſtant from the equator. Its precepts were probably at firſt only ſet down on the ſea-charts, as is the cuſtom at this day: but at length there were two Spaniſh treatiſes publiſhed in 1545; one by Pedro de Medina; the other by Martin Cortes, which contained a complete ſyſtem of the art, as far as it was then known. Theſe ſeem to have been the oldeſt writers who fully handled the art; for Medina, in his dedication to Philip prince of Spain, laments that multitudes of ſhips daily periſhed at ſea, becauſe there were neither teachers of the art nor books by which it might be learned; and Cortes, in his dedication, boaſts to the emperor, that he was the firſt who had reduced navigation into a compendium, valuing himſelf much on what he had performed. Medina defended the plane chart; but he was oppoſed by Cortes, who ſhowed its errors, and endeavoured to account for the variation of the compaſs, by ſuppoſing the needle to be influenced by a magnetic pole (which he called the *point attractive*) different from that of the world; which notion hath been farther proſecuted by others. Medina's book was ſoon tranſlated into Italian, French, and Flemiſh, and ſerved for a long time as a guide to foreign navigators. However, Cortes was the favourite author of the Engliſh nation, and was tranſlated in 1561; while medina's work was entirely neglected, though tranſlated alſo within a ſhort time of the other. At that time the ſyſtem of navigation conſiſted of the following particulars, and others ſimilar: an account of the Ptolemaic hypotheſis, and the circles of the ſphere; of the roundneſs of the earth, the longitudes, latitudes, climates, &c. and eclipſes of the luminaries: a kalendar; the method of finding the prime, epact, moon's age, and tides; a deſcription of the compaſs, an account of its variation, for the diſcovering of which Cortes ſaid an inſtrument might eaſily be contrived; tables of the ſun's declination for four years, in order to find the latitude from his meridian altitude; directions to find the ſame by certain ſtars; of the courſe of the ſun and moon; the length of the days; of time and its diviſions; the method of finding the hour of the day and night; and laſtly, a deſcription of the ſea-chart, on which to diſcover where the ſhip is, they made uſe of a ſmall table, that ſhowed, upon an alteration of one degree of the latitude, how many leagues were run in each rhumb, together with the departure from the meridian. Beſides, ſome inſtruments were deſcribed, eſpecially by Cortes; ſuch as one to find the place and declination of the ſun, with the days, and place of the moon; certain dials, the aſtrolabe, and croſs-ſtaff; with a complex machine to diſcover the hour and latitude at once.

About the ſame time were made propoſals for finding the longitude by obſervations of the moon.—In 1530, Gemma Friſius adviſed the keeping of the time by means of ſmall clocks or watches, then, as he ſays, newly invented. He alſo contrived a new ſort of croſs ſtaff and an inſtrument called the *nautical quadrant*; which laſt was much praiſed by William Cunningham, in his *Aſtronomical Glaſs*, printed in the year 1559.

In 1537 Pedro Nunez, or Nonius, publiſhed a book in the Portugueſe language, to explain a difficulty in navigation propoſed to him by the commander Don Martin Alphonſo de Suſa. In this he expoſes the errors of the plane chart, and likewiſe gives the ſolution of ſeveral curious aſtronomical problems; amongſt which is that of determining the latitude from two obſervations of the ſun's altitude and intermediate azimuth being given. He obſerved, that though the rhumbs are ſpiral lines, yet the direct courſe of a ſhip will always be in the arch of a great circle, whereby the angle with the meridians will continually change: all that the ſteerſman can here do for the preſerving of the original rhumb, is to correct theſe deviations as ſoon as they appear ſenſible. But thus the ſhip will in reality deſcribe a courſe without the rhumb-line intended; and therefore his calculations for aſſigning the latitude, where any rhumb line croſſes the ſeveral meridians, will be in ſome meaſure erroneous. He invented a method of dividing a quadrant by means of concentric circles, which, after being much improved by Dr Halley, is uſed at preſent, and is called a *nonius*.

In 1577, Mr William Bourne publiſhed a treatiſe, in which, by conſidering the irregularities in the moon's motion, he ſhows the errors of the ſailors in finding her age by the epact, and alſo in determining the hour from obſerving on what point of the compaſs the ſun and moon appeared. He adviſes, in ſailing towards the high latitudes, to keep the reckoning by the globe, as there the plane chart is moſt erroneous. He deſpairs of our ever being able to find the longitude, unleſs the variation of the compaſs ſhould be occaſioned by ſome ſuch attractive point, as Cortes had imagined; of which, however, he doubts: but as he had ſhown how to find the variation at all times, he adviſes to keep an account of the obſervations, as uſeful for finding the place of the ſhip; which advice was proſecuted at large by Simon Stevin, in a treatiſe publiſhed at Leyden in 1599: the ſubſtance of which was the ſame year printed at London in Engliſh by Mr Edward Wright, intitled the *Haven finding Art*. In this ancient tract alſo is deſcribed the way by which our ſailors eſtimate the rate of a ſhip in her courſe, by an inſtrument called the *log*. This was ſo named from the piece of wood or log that floats in the water while the time is reckoned during which the line that is faſtened to it is veering out. The author of this contrivance is not known; neither was it taken notice of till 1607, in an Eaſt India voyage publiſhed by Purchas: but from this time it became famous, and was much taken notice of by almoſt all writers on navigation in every country: and it ſtill continues to be uſed as at firſt, though many attempts have been made to improve it, and contrivances propoſed to ſupply its place; many of which have ſucceeded in quiet water but proved uſeleſs in a ſtormy ſea.

In 1581 Michael Coignet, a native of Antwerp, publiſhed a treatiſe, in which he animadverted on Medina. In this he ſhowed that as the rhumbs are ſpirals, making endleſs revolutions about the poles, numerous errors muſt ariſe from their being repreſented by ſtraight lines on the ſea charts; but though he hoped to find a remedy for theſe errors, he was of opinion that the propoſals of Nonius were ſcarcely practicable, and therefore in a great meaſure uſeleſs. In treating of the ſun's declination, he took notice of the gradual decreaſe in the obliquity of the ecliptic; he alſo deſcribed the croſs-ſtaff with three tranſverſe pieces, as it is at preſent made, and which he owned to have been then in common uſe among the ſailors. He likewiſe gave ſome inſtruments of his own invention; but all of them are now laid aſide, excepting perhaps his nocturnal. He conſtructed a ſea-table to be uſed by ſuch as ſailed beyond the 60th degree of latitude; and at the end of the book is delivered a method of ſailing on a parallel of latitude by means of a ring dial and a 24 hour glaſs. The ſame year the diſcovery of the dipping-needle was made by Mr Robert Norman *. In his publication on that art he maintains in oppoſition to Cortes, that the variation of the compaſs was cauſed by ſome point on the ſurface of the earth, and not in the heavens: he alſo made conſiderable improvements in the conſtruction of compaſſes themſelves; ſhowing eſpecially the danger of not fixing, on account of the variation, the wire directly under the *flower de luce*; as compaſſes made in different countries have it placed differently. To this performance of Norman's is always prefixed a diſcourſe on the variation of the magnetical needle by Mr William Burrough, in which he ſhows how to determine the variation in many different ways. He alſo points out many errors in the practice of navigation at that time, and ſpeaks in very ſevere terms concerning thoſe who had publiſhed upon it.

* See Dipping-needle.

All this time the Spaniards continued to publiſh treatiſes on the art. In 1585 an excellent compendium was publiſhed by Roderico Zamorano; which contributed greatly towards the improvement of the art, particularly in the ſea charts. Globes of an improved kind, and of a much larger ſize than thoſe formerly uſed, were now conſtructed, and many improvements were made in other inſtruments; however the plane chart continued ſtill be followed, though its errors were frequently complained of. Methods of removing theſe errors had indeed been ſought after; and Gerard Mercator ſeems to have been the firſt who found the true method of doing this ſo as to anſwer the purpoſes of ſeamen. His method was to repreſent the parallels both of latitude and longitude by parallel ſtraight lines, but gradually to augment the former as they approached the pole. Thus the rhumbs, which otherwiſe ought to have been curves, were now alſo extended into ſtraight lines: and thus a ſtraight line drawn between any two places marked upon the chart would make an angle with the meridians, expreſſing the rhumb leading from the one to the other. But though, in 1569, Mercator publiſhed an univerſal map conſtructed in this manner, it doth not appear that he was acquainted with the principles on which this proceeded: and it is now generally believed, that the true principles on which the conſtruction of what is called *Mercator's chart* depends, were firſt diſcovered by an Engliſhman, Mr Edward Wright.

Mr Wright ſuppoſes, but, according to the general opinion, without ſufficient grounds, that this enlargement of the degrees of latitude was known and mentioned by Ptolemy, and that the ſame thing had alſo been ſpoken of by Cortes. The expreſſions of Ptolemy alluded to, relate indeed to the proportion between the diſtances of the parallels and meridians; but inſtead of propoſing any gradual enlargement of the parallels of latitude, in a general chart, he ſpeaks only of particular maps; and adviſes not to confine a ſyſtem of ſuch maps to one and the ſame ſcale, but to plan them out by a different meaſure, as occaſion might require: only with this precaution, that the degrees of longitude in each ſhould bear ſome proportion to thoſe of latitude; and this proportion is to be deduced from that which the magnitude of the reſpective parallels bear to a great circle of the ſphere. He adds that in particular maps, if this proportion be obſerved with regard to the middle parallel, the inconvenience will not be great though the meridians ſhould be ſtraight lines parallel to each other. Here he is ſaid only to mean, that the maps ſhould in ſome meaſure repreſent the figures of the countries for which they are drawn. In this ſenſe Mercator, who drew maps for Ptolemy's tables, underſtood him; thinking it, however, an improvement not to regulate the meridians by one parallel, but by two; one diſtant from the northern, the other from the ſouthern extremity of the map by a fourth part of the whole depth: by which means, in his maps, though the meridians are ſtraight lines, yet they are generally drawn inclining to each other towards the poles. With regard to Cortes, he ſpeaks only of the number of degrees of latitude, and not of the extent of them; nay, he gives expreſs directions that they ſhould all be laid down by equal meaſurement on ſcale of leagues adapted to the map.

For ſome time after the apearance of Mercator's map, it was not rightly underſtood, and it was even thought to be entirely uſeleſs, if not detrimental.—However, about the year 1592, its utility began to be perceived: and ſeven years after, Mr Wright printed his famous treatiſe entitled, *The Correction of certain Errors in Navigation*, where he fully explained the reaſon of extending the length of the parallels of latitude, and the uſes of it to navigators. In 1610, a ſecond edition of Mr Wright's book was publiſhed with improvements. An excellent method was propoſed of determining the magnitude of the earth; at the ſame time it was judiciouſly propoſed to make our common meaſures in ſome proportion to a degree on its ſurface, that they might not depend on the uncertain length of a barley-corn. Some of his other improvements were, "The Table of latitudes for dividing the meridian computed to minutes;" whereas it had only been divided to every tenth minute. He alſo publiſhed a deſcription of an inſtrument which he calls the *ſea-rings*; and by which the variation of the compaſs, altitude of the ſun and time of the day, may be determined readily at once in any place, provided the latitude is known. He ſhowed alſo how to correct the errors ariſing from the eccentricity of the eye in obſerving by the croſs-ſtaff. He made a total amendment in the tables of the declinations and places of the ſun and ſtars from his own obſervations made with a ſix-foot quadrant in the year 1594, 95, 96, and 97. A ſea quadrant to take altitudes by a forward or backward obſervation; and likewiſe with a contrivance for the ready finding the latitude by the height of the pole-ſtar, when not upon the meridian. To this edition was ſubjoined a tranſlation of Zamorano's Compendium above mentioned, in which he corrected ſome miſtakes in the original; adding a large table of the variation of the compaſs obſerved in very different parts of the world, to ſhow that it was not occaſioned by any magnetical pole.

Theſe improvements ſoon became known abroad.—In 1608, a treatiſe intitled, *Hypomnemata Mathematica*, was publiſhed by Simon Stevin, for the uſe of Prince Maurice. In that part relating to navigation, the author having treated of ſailing on a great circle, and ſhewn how to draw the rhumbs on a globe mechanically, ſets down Wright's two tables of latitudes and of rhumbs, in order to deſcribe theſe lines more accurately, pretending even to have diſcovered an error in Wright's table. But all Stevin's objections were fully anſwered by the author himſelf, who ſhowed that they aroſe from the groſs way of calculating made uſe of by the former.

In 1624, the learned Wellebrordus Snellius, profeſſor of mathematics at Leyden, publiſhed a treatiſe of navigation on Wright's plan, but ſomewhat obſcurely; and as he did not particularly mention all the diſcoveries of Wright, the latter was thought by ſome to have taken the hint of all his diſcoveries from Snellius. But this ſuppoſition is long ago refuted; and Wright enjoys the honour of thoſe diſcoveries which is juſtly his due.

Mr Wright having ſhown how to find the place of the ſhip on his chart, obſerved that the ſame might be performed more accurately by calculation: but conſidering, as he ſays, that the latitudes, and eſpecially, the courſes at ſea, could not be determined ſo preciſely, he forbore ſetting down particular examples: as the mariner may be allowed to ſave himſelf this trouble, and only mark out upon his chart the ſhip's way, after the manner then uſually practiſed. However, in 1614, Mr Raphe Handſon, among his nautical queſtions ſubjoined to a tranſlation of Pitiſcus's trigonometry, ſolved very diſtinctly every caſe of navigation by applying arithmetical calculations to Wright's table of latitudes, or of meridional parts, as it hath ſince been called. Though the method diſcovered by Wright for finding the change of longitude by a ſhip ſailing on a rhumb is the proper way of performing it Handſon alſo propoſes two ways of approximation to it without the aſſiſtance of Wright's diviſion of the meridian line. The firſt was computed by the arithmetical mean between the coſines of both latitudes; the other by the ſame mean between the ſecants as an alternative, when Wright's book was not at hand; though this latter is wider from the truth than the firſt. By the ſame calculations alſo he ſhowed how much each of theſe compendiums deviates from the truth, and alſo how widely the computations on the erroneous principles of the plane chart differ from them all. The method, however, commonly uſed by our ſailors is commonly called the *middle-latitude*; which, though it errs more than by the arithmetical mean between the two co-ſines, is preferred on account of its being leſs operoſe: yet in high latitudes it is more eligible to uſe that of the arithmetical mean between the logarithmic co-ſines equivalent to the geometrical mean between the co-ſines themſelves; a method ſince propoſed by Mr John Baſſat. The computation by the middle latitude will always fall ſhort of the true change of longitude; that by the geometrical mean will always

ways exceed; but that by the arithmetical mean falls ſhort in latitudes above 45 degrees, and exceeds in leſſer latitudes. However, none of theſe methods will differ much from the truth when the change of latitude is ſufficiently ſmall.

About this time logarithms were invented by John Napier, baron of Merchiſton in Scotland, and proved of the utmoſt ſervice to the art of navigation. From which Mr Edmund Gunter conſtructed a table of logarithmic ſines and tangents to every minute of the quadrant, which he publiſhed in 1620. In this work he applied to navigation, and other branches of mathematics, his admirable ruler known by the name of Gunter's ſcale *; on which are deſcribed lines of logarithms, of logarithmic ſines and tangents, of meridional parts, &c. He greatly improved the ſector for the ſame purpoſes. He ſhowed alſo how to take a back-obſervation by the croſs-ſtaff, whereby the error ariſing from the eccentricity of the eye is avoided. He deſcribed likewiſe another inſtrument, of his own invention, called the *croſs bow*, for taking altitudes of the ſun or ſtars, with ſome contrivances for the more ready collecting the latitude from the obſervation. The diſcoveries concerning logarithms were carried to France in 1624 by Mr Edmund Wingate, who publiſhed two ſmall tracts in that year at Paris. In one of theſe he taught the uſe of Gunter's ſcale; and in the other, of the tables of artificial ſines and tangents, as modelled according to Napier's laſt form, erroneouſly attributed by Wingate to Briggs.

Gunter's rule was projected into a circular arch by the Reverend Mr William Oughtred in 1633, and its uſes fully ſhown in a pamphlet intitled, *The Circles of Proportion*, where, in an appendix, are well treated ſeveral important points in navigation. It has alſo been made in the form of a ſliding ruler.

The logarithmic tables were firſt applied to the different caſes of ſailing by Mr Thomas Addiſon, in his treatiſe intitled, *Arithmetical navigation*, printed in 1625. He alſo gives two traverſe tables, with their uſes; the one to quarter points of the compaſs, the other to degrees. Mr Henry Gellibrand publiſhed his diſcovery of the changes of the variation of the compaſs, in a ſmall quarto pamphlet, intitled, *A diſcourſe mathematical on the variation of the magnetical needle*, printed in 1635. This extraordinary phenomenon he found out by comparing the obſervations made at different times near the ſame place by Mr Burrough, Mr Gunter, and himſelf, all perſons of great ſkill and experience in theſe matters. This diſcovery was likewiſe ſoon known abroad; For Father Athanaſius Kircher, in his treatiſe intitled, *Magnes*, firſt printed at Rome in 1641, informs us, that he had been told it by Mr John Greaves; and then gives a letter of the famous Marinus Merſennus, containing a very diſtinct account of the ſame.

As altitudes of the ſun are taken on ſhipboard by obſerving his elevation above the viſible horizon, to obtain from thence the ſun's true altitude with correctneſs, Wright obſerves it to be neceſſary that the dip of the viſible horizon below the horizontal plane paſſing through the obſerver's eye ſhould be brought into the account, which cannot be calculated without knowing the magnitude of the earth. Hence he was induced to propoſe different methods for finding this; but complains that the moſt effectual was out of his power to execute; and therefore contented himſelf with a rude attempt, in ſome meaſure ſufficient for his purpoſe: and the dimenſions of the earth deduced by him correſponded very well with the uſual diviſions of the log-line; however, as he wrote not an expreſs treatiſe on navigation, but only for the correcting ſuch errors as prevailed in general practice, the log-line did not fall under his notice. Mr Richard Norwood, however, put in execution the method recommended by Mr Wright as the moſt perfect for meaſuring the dimenſions of the earth, with the true length of the degrees of a great circle upon it; and, in 1635, he actually meaſured the diſtance between London and York; from whence, and the ſummer ſolſtitial altitudes of the ſun obſerved on the meridian at both places, he found a degree on a great circle of the earth to contain 367,196 Engliſh feet, equal to 57,300 French fathoms or tortoiſes: which is very exact, as appears from many meaſures that have been made ſince that time. Of all this Mr Norwood gave a full account in his treatiſe called *The Seaman's Practice*, publiſhed in 1637. He there ſhows the reaſon why Snellius had failed in his attempt: he points out alſo various uſes of his diſcovery, particularly for correcting the groſs errors hitherto committed in the diviſions of the log-line. But neceſſary amendments have been little attended to by ſailors, whoſe obſtinacy in adhering to eſtabliſhed errors has been complained of by the beſt writers on navigation. This improvement has at length, however, made its way into practice, and few navigators of reputation now make uſe of the old meaſure of 42 feet to a knot. In that treatiſe alſo Mr Norwood deſcribes his own excellent method of ſetting down and perfecting a dead-reckoning, by uſing a traverſe table; which method he had followed and taught for many years. He ſhows alſo how to rectify the courſe by the variation of the compaſs being conſidered; as alſo how to diſcover currents, and to make proper allowance on their account. This treatiſe, and another on trignometry, were continually reprinted, as the principal books for learning ſcientifically the art of navigation. What he had delivered, eſpecially in the latter of them, concerning this ſubject, was contracted as a manual for ſailors, in a very ſmall piece called his *Epitome*; which uſeful performance has gone through a great number of editions. No alterations were ever made in the Seaman's Practice till the 12th edition in 1676, when the following paragraph was inſerted in a ſmaller character: "About the year 1672, Monſieur Picart has publiſhed an account in French, concerning the meaſure of the earth, a breviate whereof may be ſeen in the Philoſophical Tranſactions, N° 112. wherein he concludes one degree to contain 365,184 Engliſh feet, nearly agreeing with Mr Norwood's experiment;" and this advertiſement is continued through the ſubſequent editions as late as the year 1732.

About the year 1645, Mr Bond publiſhed in Norwood's epitome a very great improvement in Wright's method by a property in his meridian line, whereby its diviſions are more ſcientifically aſſigned than the author himſelf was able to effect; which was from this theorem, that theſe diviſions are analogous to the exceſſes of the logarithmic tangents of half the reſpective latitudes augmented by 45 degrees above the logarithm of the radius.

* See Gunter's Scale.

dius. This he afterwards explained more fully in the third edition of Gunter's works, printed in 1653; where, after obſerving that the logarithmic tangents from 45° upwards increaſe in the ſame manner that the ſecants added together do, if every half degree be accounted as a whole degree of Mercator's meridional line. His rule for computing the meridional parts belonging to any two latitudes, ſuppoſed on the ſame ſide of the equator, is to the following effect: "Take the logarithmic tangent, rejecting the radius, of half each latitude, augmented by 45 degrees; divide the difference of thoſe numbers by the logarithmic tangent of 45° 30′, the radius being likewiſe rejected; and the quotient will be the meridional parts required, expreſſed in degrees." This rule is the immediate conſequence from the general theorem, That the degrees of latitude bear to one degree (or 60 minutes, which in Wright's table ſtands for the meridional parts of one degree), the ſame proportion as the logarithmic tangent of half any latitude augmented by 45 degrees, and the radius neglected, to the like tangent of half a degree augmented by 45 degrees, with the radius likewiſe rejected. But here was farther wanting the demonſtration of this general theorem, which was at length ſupplied by Mr James Gregory of Aberdeen in his *Exercitationes Geometricæ*, printed at London in 1668; and afterwards more conciſely demonſtrated, together with a ſcientific determination of the diviſor, by Dr Halley in the Philoſophical Tranſactions for 1695, N° 219. from the conſideration of the ſpirals into which the rhumbs are transformed in the ſtereographic projection of the ſphere upon the plane of the equinoctial; and which is rendered ſtill more ſimple by Mr Roger Cotes, in his Logometria, firſt publiſhed in the Philoſophical Tranſactions for 1714, N° 388. It is moreover added in Gunter's book, that if $\frac{1}{20}$th of this diviſion, which does not ſenſibly differ from the logarithmic tangent of 45° 1′ 30″ (with the radius ſubtracted from it), be uſed, the quotient will exhibit the meridional parts expreſſed in leagues: and this is the diviſor ſet down in Norwood's Epitome. After the ſame manner the meridional parts will be found in minutes, if the like logarithmic tangent of 45° 1′ 30″, diminiſhed by the radius, be taken; that is, the number uſed by others being 12633, when the logarithmic tables conſiſt of eight places of figures beſides the index.

In an edition of the Seamen's Kalendar, Mr Bond declared, that he had diſcovered the longitude by having found out the true theory of the magnetic variation; and to gain credit to his aſſertion, he foretold, that at London in 1657 there would be no variation of the compaſs, and from that time it would gradually increaſe the other way; which happened accordingly. Again, in the Philoſophical Tranſactions for 1668, N° 40. he publiſhed a table of the variation for 49 years to come. Thus he acquired ſuch reputation, that his treatiſe, intitled, *The Longitude Found*, was in 1676 publiſhed by the ſpecial command of Charles II. and approved by many celebrated mathematicians. It was not long, however, before it met with oppoſition; and in 1678 another treatiſe, intitled, *The Longitude not Found*, made its appearance; and as Mr Bond's hypotheſis did not in any manner anſwer its author's ſanguine expectations, the affair was undertaken by Dr Halley. The reſult of his ſpeculation was, that the magnetic needle is influenced by four poles; but this wonderful phenomenon ſeems hitherto to have eluded all our reſearches. In 1700, however, Dr Halley publiſhed a general map, with curve lines expreſſing the paths where the magnetic needle had the ſame variation; which was received with univerſal applauſe. But as the poſitions of theſe curves vary from time to time, they ſhould frequently be corrected by ſkilful perſons; as was done in 1744 and 1756, by Mr William Mountaine, and Mr James Dodſon, F. R. S. In the Philoſophical Tranſactions for 1690, Dr Halley alſo gave a diſſertation on the monſoons; containing many very uſeful obſervations for ſuch as ſail to places ſubject to theſe winds.

After the true principles of the art were ſettled by Wright, Bond, and Norwood, the authors on navigation became ſo numerous, that it would be impoſſible to enumerate them. New improvements were daily made, and every thing relative to it was ſettled with an accuracy not only unknown to former ages, but which would have been reckoned utterly impoſſible. The earth being found to be a ſpheroid, and not a perfect ſphere, with the ſhorteſt diameter paſſing thro' the poles, a tract was publiſhed in 1741 by the Rev. Doctor Patrick Murdoch, wherein he accommodated Wright's ſailing to ſuch a figure; and Mr Colin Maclaurin, the ſame year, in the Philoſophical Tranſactions, N° 461. gave a rule for determining the meridional parts of a ſpheroid; which ſpeculation is farther treated of in his book of Fluxions, printed at Edinburgh in 1742.

Among the later diſcoveries in navigation, that of finding the longitude both by lunar obſervations and by time keepers is the principal. It is owing chiefly to the rewards offered by the Britiſh parliament that this has attained the preſent degree of perfection. We are indebted to Dr Maſkelyne for putting the firſt of theſe methods in practice, and for other important improvements in navigation. The time-keepers, conſtructed by Harriſon for this expreſs purpoſe, were found to anſwer ſo well, that he obtained the parliamentary reward.

THEORY OF NAVIGATION.

THE motion of a ſhip in the water is well known to depend on the action of the wind upon its ſails, regulated by the direction of the helm. As the water is a reſiſting medium, and the bulk of the ſhip very conſiderable, it thence follows, that there is always a great reſiſtance on her fore-part; and when this reſiſtance becomes ſufficient to balance the moving force of the wind upon the ſails, the ſhip attains her utmoſt degree of velocity, and her motion is no longer accelerated. This velocity is different according to the different ſtrength of the wind; but the ſtronger the wind, the greater reſiſtance is made to the ſhip's paſſage through the water: and hence, though the wind ſhould blow ever ſo ſtrong, there is alſo a limit to the velocity of the ſhip: for the ſails and ropes can bear but a certain force of air; and when the reſiſtance on the fore-part becomes more than equivalent to their ſtrength, the velocity can be no longer increaſed, and the rigging gives way.

The direction of a ſhip's motion depends on the poſition of her ſails with regard to the wind, combined with the action of the rudder. The moſt natural direction of the ſhip is, when ſhe runs directly before the wind, the ſails are then diſpoſed, ſo as to be at right angles thereto. But this is not always the caſe, both on account of the variable nature of the winds, and the ſituation of the intended port, or of intermediate headlands or iſlands. When the wind therefore happens not to be favourable, the ſails are placed ſo as to make an oblique angle both with the direction of the ſhip and with the wind and the ſails, together with the rudder, muſt be managed in ſuch a manner, that the direction of the ſhip may make an acute angle with that of the wind, and the ſhip making boards on different tacks, will by this means arrive at the intended port.

The reaſon of the ſhip's motion in this caſe is, that the water reſiſts the ſide more than the fore-part, and that in the ſame proportion as her length exceeds her breadth. This proportion is ſo conſiderable, that the ſhip continually flies off where the reſiſtance is leaſt, and that ſometimes with great ſwiftneſs. In this way of ſailing, however, there is a great limitation: for if the angle made by the keel with the direction of the wind be too acute, the ſhip cannot be kept in that poſition; neither is it poſſible for a large ſhip to make a more acute angle with the wind than about 6 points; though ſmall ſloops, it is ſaid, may make an angle of about five points with it. In all theſe caſes, however, the velocity of the ſhip is greatly retarded; and that not only on account of the obliquity of her motion, but by reaſon of what is called her *lee-way*. This is occaſioned by the yielding of the water on the lee ſide of the ſhip, by which means the veſſel acquires a compound motion, partly in the direction of the wind, and partly in that which is neceſſary for attaining the deſired port.

It is perhaps impoſſible to lay down any mathematical principles on which the lee-way of a ſhip could be properly calculated; only we may ſee in general that it depends on the ſtrength of the wind, the roughneſs of the ſea, and the velocity of the ſhip. When the wind is not very ſtrong, the reſiſtance of the water on the lee-ſide bears a very great proportion to that of the current of air: and therefore it will yield but very little: however, ſuppoſing the ſhip to remain in the ſame place, it is evident, that the water having once begun to yield, will continue to do ſo for ſome time, even though no additional force was applied to it; but as the wind continually applies the ſame force as at firſt, the lee-way of the ſhip muſt go on conſtantly increaſing till the reſiſtance of the water on the lee-ſide balances the force applied on the other, when it will become uniform, as doth the motion of a ſhip ſailing before the wind. If ſhe changes her place with any degree of velocity, then every time ſhe moves her own length a new quantity of water is to be put in motion, which hath not yet received any momentum, and which of conſequence will make a greater reſiſtance than it can do when the ſhip remains in the ſame place. In proportion to the ſwiftneſs of the ſhip, then the lee-way will be the leſs: but if the wind is very ſtrong, the velocity of the ſhip bears but a ſmall proportion to that of the current of air; and the ſame effects muſt follow as though the ſhip moved ſlowly, and the wind was gentle; that is, the ſhip muſt make a great deal of lee-way.—The ſame thing happens when the ſea riſes high, whether the wind is ſtrong or not; for then the whole water of the ocean, as far as the ſwell reaches, hath acquired a motion in a certain direction, and that to a very conſiderable depth. The mountainous waves will not fail to carry the ſhip very much out of her courſe; and this deviation will certainly be according to their velocity and magnitude. In all caſes of a rough ſea, therefore, a great deal of lee way is made.—Another circumſtance alſo makes a variation in the quantity of the lee-way; namely, the lightneſs or heavineſs of the ſhip; it being evident, that when the ſhip ſinks deep in the water, a much greater quantity of that element is to be put in motion before ſhe can make any lee-way, than when ſhe ſwims on the ſurface. As therefore it is impoſſible to calculate all theſe things with mathematical exactneſs, it is plain that the real courſe of a ſhip is exceedingly difficult to be found, and frequent errors muſt be made, which only can be corrected by celeſtial obſervations.

In many places of the ocean there are *currents*, or places where the water, inſtead of remaining at reſt, runs with a very conſiderable velocity for a great way in ſome particular direction, and which will certainly carry the ſhip greatly out of her courſe. This occaſions an error of the ſame nature with the lee-way; and therefore, whenever a current is perceived, its velocity ought to be determined, and the proper allowances made.

Another ſource of error in reckoning the courſe of a ſhip proceeds from the variation of the compaſs. There are few parts of the world where the needle points exactly north; and in thoſe where the variation is known, it is ſubject to very conſiderable alterations. By theſe means the courſe of the ſhip is miſtaken; for as the ſailors have no other ſtandard to direct them than the compaſs, if the needle, inſtead of pointing due north, ſhould point north-eaſt, a prodigious error would be occaſioned during the courſe of the voyage, and the ſhip would not come near the port to which ſhe was bound. To avoid errors of this kind the only method is, to obſerve the ſun's amplitude and azimuth as frequently as poſſible, by which the variation of the compaſs will be perceived, and the proper allowances can then be made for errors in the courſe which this may have occaſioned.

Errors will ariſe in the reckoning of a ſhip, eſpecially when ſhe ſails in high latitudes, from the ſpheroidal figure of the earth; for as the polar diameter of our globe is found to be conſiderably ſhorter than the equatorial one, it thence follows, that the farther we remove from the equator, the longer are the degrees of latitude. Of conſequence, if a navigator aſſigns any certain number of miles for the length of a degree of latitude near the equator, he muſt vary that meaſure as he approaches towards the poles, otherwiſe he will imagine that he hath not ſailed ſo far as he actually hath done. It would therefore be neceſſary to have a table containing the length of each degree of latitude in every part of the globe from the equator to either pole; as without this a troublesome calculation must be made at every time the navigator makes a reckoning of his courſe. Such a table, however, hath not yet appeared; neither indeed does it ſeem to be an eaſy matter to make it, on account of the difficulty of meaſuring the length even of one or two degrees of latitude in different parts of the world. Sir Iſaac Newton firſt diſcovered this ſpheroidal figure of the earth; and ſhowed from experiments on pendulums, that the polar diameter was to the equatorial one as 229 to 230. This proportion, however, hath not been admitted by ſucceeding calculators. The French mathematicians, who meaſured a degree on the meridian in Lapland, made the proportion between the equatorial and polar diameters to be as 1 to 0.9891. Thoſe who meaſured a degree at Quito in Peru, made the proportion 1 to 0.99624, or 266 to 265. M. Bouquer makes the proportion to be as 179 to 178; and M. Buffon, in one part of his theory of the earth, makes the equatorial diameter exceed the polar one by $\frac{1}{167}$ of the whole. According to M. du Sejour, this proportion is as 321 to 320; and M. de la Place, in his Memoir upon the Figure of Spheroids has deduced the ſame proportion. From theſe variations it appears that the point is not exactly determined, and conſequently that any corrections which can be made with regard to the ſpheroidal figure of the earth muſt be very uncertain.

It is of conſequence to navigators in a long voyage to take the neareſt way to their port; but this can ſeldom be done without conſiderable difficulty. The ſhorteſt diſtance between any two points on the ſurface of a ſphere is meaſured by an arch of a great circle intercepted between them; and therefore it is adviſable to direct the ſhip along a great circle of the earth's ſurface. But this is a matter of conſiderable difficulty, becauſe there are no fixed marks by which it can be readily known whether the ſhip ſails in the direction of a great circle or not. For this reaſon the ſailors commonly chooſe to direct their courſe by the rhumbs, or the bearing of the place by the compaſs. Theſe bearings do not point out the ſhorteſt diſtance between places; becauſe, on a globe, the rhumbs are ſpirals, and not arches of great circles. However, when the places lie directly under the equator, or exactly under the ſame meridian, the rhumb then coincides with the arch of a great circle, and of conſequence ſhows the neareſt way. The ſailing on the arch of a great circle is called *great circle ſailing;* and the caſes of it depend all on the ſolution of problems in ſpherical trigonometry.

PRACTICE OF NAVIGATION.

BOOK I.

Containing the various Methods of Sailing.

INTRODUCTION.

THE art of navigation depends upon aſtronomical and mathematical principles. The places of the ſun and fixed ſtars are deduced from obſervation and calculation, and arranged in tables, the uſe of which is abſolutely neceſſary in reducing obſervations taken at ſea, for the purpoſe of aſcertaining the latitude and longitude of the ſhip, and the variation of the compaſs. The problems in the various ſailings are reſolved either by trigonometrical calculation, or by tables or rules formed by the aſſiſtance of trigonometry. By mathematics, the neceſſary tables are conſtructed, and rules inveſtigated for performing the more difficult parts of navigation. For theſe ſeveral branches of ſcience, and for logarithmic tables, the reader is referred to the reſpective articles in this work. A few tables are given at the end of this article; but as the other tables neceſſary for the practice of navigation are to be found in almoſt every treatiſe on that ſubject, it therefore ſeems unneceſſary to inſert them in this place.

CHAP. I. *Preliminary Principles.*

SECT. I. *Of the Latitude and Longitude of a Place.*

THE ſituation of a place on the ſurface of the earth is eſtimated by its diſtance from two imaginary lines interſecting each other at right angles: The one of theſe is called the *equator*, and the other the *firſt meridian*. The ſituation of the equator is fixed, but that of the firſt meridian is arbitrary, and therefore different nations aſſume different firſt meridians. In Britain, that which paſſes through the royal obſervatory at Greenwich is eſteemed to be the firſt meridian.

The equator divides the earth into two equal parts, called the *northern* and *ſouthern hemiſpheres;* and the latitude of a place is its diſtance from the equator, reckoned on a meridian in degrees and parts of a degree; and is either north or ſouth, according as it is in the northern or ſouthern hemiſphere.

The firſt meridian being continued round the globe, divides it into two equal parts, called the *eaſtern* and *weſtern hemiſpheres;* and the longitude of a place is that portion of the equator contained between the firſt meridian and the meridian of the given place, and is either eaſt or weſt; according as it is in the eaſtern or weſtern hemiſphere, reſpectively to the firſt meridian.

PROB. I. The latitudes of two places being given, to find the difference of latitude.

RULE. Subtract the leſs latitude from the greater, if the latitudes be of the ſame name, but add them if of contrary; and the remainder or ſum will be the difference of latitude.

EXAMPLE I. Required the difference of Latitude between the Lizard, in latitude 49° 57′ N. and Cape St Vincent, in latitude 37° 2′ N?

Latitude of the Lizard	49° 57′ N.
Latitude of Cape St Vincent	37 2 N.
Difference of latitude	12 55=775 miles.

EXAMPLE II. What is the difference of latitude between Funchal, in latitude 32° 38′ N. and the Cape of Good Hope, in latitude 34° 29′ S?

Latitude and Longitude.

Latitude of Funchal		32° 38′ N.
Lat. of Cape of Good Hope		34 29 S.
Difference of latitude		67 7 = 4027 miles.

Prob. II. Given the latitude of one place, and the difference of latitude between it and another place, to find the latitude of that place.

Rule. If the given latitude and the difference of latitude be of the ſame name, add them; but if of different names, ſubtract them, and the ſum or remainder will be the latitude required of the ſame name with the greater.

Example I. A ſhip from latitude 39° 22′ N. ſailed due north 560 miles—Required the latitude come to?

Latitude ſailed from	-	39° 22′ N.
Difference of latitude 560′	-	= 9 20 N.
Latitude come to	- -	48 42 N.

Example II. A ſhip from latitude 7° 19′ N. ſailed 854 miles ſouth—Required the latitude come to?

Latitude ſailed from	- -	7° 19′ N.
Difference of latitude 854′	-	= 14 14 S.
Latitude come to	- -	6 55 S.

Prob. III. The longitudes of two places being given, to find their difference of longitude.

Rule. If the longitudes of the given places are of the ſame name, ſubtract the leſs from the greater, and the remainder is the difference of longitude: but if the longitudes are of contrary names, their ſum is the difference of longitude. If this exceeds 180°, ſubtract it from 360°, and the remainder is the difference of longitude.

Example I. Required the difference of longitude between Edinburgh and New York, their longitude being 3° 14′ W. and 74° 10′ W. reſpectively?

Longitude of New York	- -	74° 10′ W.
Longitude of Edinburgh	- -	3 14 W.
Difference of longitude	- -	70 56

Example II. What is the difference of longitude between Maſkelyne's Iſles, in longitude 167° 59′ E. and Olinde, in longitude 35° 5′ W.?

Longitude of Maſkelyne's Iſles	-	167° 59′ E.
Longitude of Olinde	-	35 5 W.
Sum	- - - -	203 4
Subtract from	- -	360 0
Difference of longitude	-	156 56

Prob. IV. Given the longitude of a place, and the difference of longitude between it and another place, to find the longitude of that place.

Rule. If the given longitude and the difference of longitude be of a contrary name, ſubtract the leſs from the greater, and the remainder is the longitude required of the ſame name with the greater quantity; but if they are of different names, add them, and the ſum is the longitude ſought, of the ſame name with that given. If this ſum exceeds 180°, ſubtract it from 360°, the remainder is the required longitude of a contrary name to that given.

Example I. A ſhip from longitude 9° 54′ E. ſailed weſterly till the difference of longitude was 23° 18′—Required the longitude come to?

Longitude ſailed from	- -	9° 54′ E.
Difference of longitude	- .	23 18 W.
Longitude come to	- -	13 24 W.

Example II. The longitude ſailed from is 25° 9′ W. and difference of longitude 18° 46′ W.—Required the longitude come to?

Longitude left	- -	25° 9′ W.
Difference of longitude	- -	18 46 W.
Longitude in	- -	43 55 W.

Tides.

Sect. II. *Of the Tides.*

The theory of the tides has been explained under the article Astronomy, and will again be further illuſtrated under that of Tides. In this place, therefore, it remains only to explain the method of calculating the time of high water at a given place.

As the tides depend upon the joint actions of the ſun and moon, and therefore upon the diſtance of theſe objects from the earth and from each other; and as, in the method generally employed to find the time of high water, whether by the mean time of new moon or by the epacts, or tables deduced therefrom, the moon is ſuppoſed to be the ſole agent, and to have an uniform motion in the periphery of a circle, whoſe centre is that of the earth; it is hence obvious that method cannot be accurate, and by obſervation the error is ſometimes found to exceed two hours. That method is therefore rejected, and another given, in which the error will ſeldom exceed a few minutes, unleſs the tides are greatly influenced by the winds.

Prob. I. To reduce the time of the moon's phaſes as given in the Nautical Almanac to the meridian of a known place.

Rule. To the time of the propoſed phaſe, as given in the Nautical Almanac, apply the longitude of the place in time, by addition or ſubtraction, according as it is eaſt or weſt, and it will give the time of the phaſe at the given place.

Example I. Required the time of new moon at Salonique in May 1793?

Time of new moon per Naut. Alm.	9d	15h	31′
Longitude of Salonique in time	0	1	33 E.
Time of new moon required in May	9	17	4

Example II. What is the time of the laſt quarter of the moon at Reſolution Bay in October 1793?

Time of laſt quarter per Naut. Alm.	26d	5h	47
Longitude in time - -	0	9	17 W
Time at Reſolution Bay of laſt quarter, October - -	25	20	30

Prob. II. To find the time of high water at a known place.

Rule. In the Nautical Almanac ſeek in the given month, or in that immediately preceding or following it, for the time of that phaſe which happens neareſt to the given day; reduce the time of this phaſe to the meridian of the given place by Prob. I. and take the difference between the reduced time and the noon of the given day.

Find the equation anſwering to this difference in Table VII. which applied to the time of high water on the day of new or full moon at the given place, according as the table directs, will give the approximate time of high water in the afternoon.

Now take the interval between the reduced time of the phaſe and the approximate time of high water; find the correſponding equation, which applied as before to the ſyzigy time of high water, will give the time of the afternoon high water.

If the time of the morning high water is required, increaſe the laſt interval by 12 hours, if the given day falls before the phaſe, or diminiſh it by 12 hours when after that phaſe; and the equation to this time, applied to the ſyzigy time, gives the morning time of high water.

Example I. Required the morning and afternoon times of high water at Leith, 11th December 1793?

Neareſt phaſe to 11th Dec. is 1ſt quart.	9d	20h	29′
Longitude of Leith in time	—0	0	13
Time at Leith of 1ſt quarter	9	20	16
Given day - -	11	0	0
Difference - -	1	3	44
Time of H. W. at Leith-pier on ſyz.	0	2	20
Equat. from Tab. to 1d 3h 44′	+0	6	32
Approximate time of high water	11	8	52
Reduced time of 1ſt quarter -	9	20	16
Interval - - -	1	12	36
Time of high water at Leith on ſyz.	0	2	20
Equat. from the Tab. to 1d 12h 36′	0	7	0
Time of high water at Leith		9	20P.M.
Time of H. W. at Leith at full & change		2	20
Equat. to 1d 12h 36—12h=1d 0h 36′		6	22
High water at Leith, Dec. 11th, at		8	42A.M.

The time of high water found by the common method is about an hour and a half ſooner.

Example II. Required the time of high water at Funchal, 15th November 1793?

The neareſt phaſe to 15th November is that of full moon, - - -	17d	8h	46′
Longitude of Funchal in time,	0	1	8 W.
Time of full moon at Funchal, -	17d	7	38
Given day, November -	15	0	0
Difference, - -	2	7	38
Time of high water at Funchal at full and change, - -	0	12	4
Equation from the Table to 2d 7h 38′ before full moon -	—0	1	35
Approx. time of high water, Nov. 15.	0	10	29
Reduced time of full moon -	17	7	38
Interval, - -	1	11	9
Time of high water at full and change,	0	12	4
Equation to 1d 11h before full moon,	0	0	56
Time of high water, - -	0	11	8PM.

Equation to 1 d. 11 h.+12 h.=1 d. 23 h. is 1 h, 15′, and 12 h. 4′—1 h. 15′=10 h. 49′=time of high water in the forenoon.

Example III. Required the time of high water at Duſkey Bay, 24th of October 1793?

The neareſt phaſe to the 24th October is the laſt quarter - -	26d	5h	47′
Longitude of Duſkey Bay in time,	+0	11	5 E.
Reduced time of firſt quarter of moon,	26	16	52
Given day, - -	24	0	0
Difference, - -	2	16	52
Time of high water at full and change,		10h	67′
Equation to 2d 16h 52′ before laſt quarter, - -	+	2	52
Approximate time of high water,		1	49
Change of equation to app. time 1h 49′			3
Time of high water in the afternoon,		1	52
Change of equation to 12 hours, -			20
Time of high water in the morning,		1	32

Sect. III. *Of meaſuring a Ship's Run in a given time.*

The method commonly uſed at ſea to find the diſtance ſailed in a given time, is by means of a log-line and half minute-glaſs. A deſcription of theſe is given under the articles Log and Log-line, which ſee.

It has been already obſerved, that the interval between each knot on the line ought to be 50 feet, in order to adapt it to a glaſs that runs 30 ſeconds. But although the line and glaſs be at any time perfectly adjuſted to each other, yet as the line ſhrinks after being wet, and as the weather has a conſiderable effect upon the glaſs, it will therefore be neceſſary to examine them from time to time; and the diſtance given by them muſt be corrected accordingly. The diſtance ſailed may therefore be affected by an error in the glaſs, or in the line, or in both. The true diſtance may, however, be found as follows.

Prob. I. The diſtance ſailed by the log, and the ſeconds run by the glaſs, being given, to find the true diſtance, the line being ſuppoſed right.

Rule.—Multiply the diſtance given by the log by 30, and divide the product by the ſeconds run by the glaſs, the quotient will be the true diſtance.

Example I. The hourly rate of ſailing by the log is nine knots, and the glaſs is found to run out in 35 ſeconds. Required the true rate of ſailing?

9
30

35)270(7.7=true rate of ſailing.

Example II. The diſtance ſailed by the log is 73 miles, and the glaſs runs out in 26 ſeconds. Sought the true diſtance?

73
30

26)2190(84.2 the true diſtance.

Prob. II. Given the diſtance ſailed by the log, and the meaſured interval between two adjacent knots on the line, to find the true diſtance, the glaſs running exactly 30 ſeconds.

Rule. Multiply twice the diſtance ſailed by the meaſured length of a knot, point off two figures to the right, and the remainder will be the true diſtance.

Example I. The hourly rate of ſailing by the log is five knots, and the interval between knot and knot meaſures 53 feet. Required the true rate of ſailing?

Meaſured interval = 53
Twice hourly rate = 10
True rate of ſailing, = 5.30

Example II. The diſtance ſailed is 64 miles, by a log-line which meaſures 42 feet to a knot. Required the true diſtance?

Twice given diſtance, = 128
Meaſured interval, 42
256
512
True diſtance, 53.76

Prob. III. Given the length of a knot, the number of ſeconds run by the glaſs in half a minute, and the diſtance ſailed by the log; to find the true diſtance.

Rule. Multiply the diſtance ſailed by the log by ſix times the meaſured length of a knot, and divide the product by the ſeconds run by the glaſs, the quotient, pointing off one figure to the right, will be the true diſtance.

Example. The diſtance ſailed by the log is 159 miles, the meaſured length of a knot is 42 feet, and the glaſs runs 33 ſeconds in half a minute. Required the true diſtance?

Diſtance by the log, 159
Six times length of a knot=42×6=252
318
795
318
Second run by the glaſs = 33)40068(121.4= true diſtance.

Chap. II. *Of Plane Sailing.*

Plane ſailing is the art of navigating a ſhip upon principles deduced from the notion of the earth's being an extended plane. On this ſuppoſition the meridians are eſteemed as parallel right lines. The parallels of latitude are at right angles to the meridians; the lengths of the degrees on the meridians, equator, and parallels of latitude, are every where equal; and the degrees of longitude are reckoned on the parallels of latitude, as well as on the equator.—In this ſailing four things are principally concerned, namely, the *courſe*, *diſtance*, *difference of latitude*, and *departure*.

The courſe is the angle contained between the meridian and the line deſcribed by the ſhip, and is uſually expreſſed in points of the compaſs.

The diſtance is the number of miles a ſhip has ſailed on a direct courſe in a given time.

The difference of latitude is the portion of a meridian contained between the parallels of latitude ſailed from and come to; and is reckoned either north or ſouth, according as the courſe is in the northern or ſouthern hemiſphere.

The departure is the diſtance of the ſhip from the meridian of the place ſhe left, reckoned on a parallel of latitude. In this ſailing, the departure and difference of longitude are eſteemed equal.

Plate cccxxxvii.

In order to illuſtrate the above, let A (fig, 1.) repreſent the poſition of any given place, and AB the meridian paſſing through that place; alſo let AC repreſent the line deſcribed by a ſhip, and C the point arrived at. From C draw CB perpendicular to AB. Now in the triangle ABC, the angle BAC repreſents the courſe, the ſide AC the diſtance, AB the difference of latitude, and BC the departure.

In conſtructing a figure relating to a ſhip's courſe, let the upper part of what the figure is to be drawn on repreſent the *north*, then the lower part will be *ſouth*, the right-hand ſide *eaſt*, and the left-hand ſide *weſt*.

A north and ſouth line is to be drawn to repreſent the meridian of the place from which the ſhip ſailed; and the upper or lower part of this line, according as the courſe is ſoutherly or northerly, is to be marked as the poſition of that place. From this point as a centre, with the chord of 60°, an arch is to be deſcribed from the meridian towards the right or left, according as the courſe is eaſterly or weſterly; and the courſe, taken from the line of chords if given in degrees, but from the line of rhumbs, if expreſſed in points of the compaſs, is to be laid upon this arch, beginning at the meridian. A line drawn through this point and that ſailed from, will repreſent the diſtance, which if given muſt be laid thereon, beginning at the point ſailed from. A line is to be drawn from the extremity of the diſtance perpendicular to the meridian: and hence the difference of latitude and departure will be obtained.

If the difference of latitude is given, it is to be laid upon the meridian, beginning at the point repreſenting the place the ſhip left; and a line drawn from the extremity of the difference of latitude perpendicular to the meridian, till it meets the diſtance produced, will limit the figure.

If the departure is given, it is to be laid off on a parallel, and a line drawn through its extremity will limit the diſtance. When either the diſtance and difference of latitude, diſtance and departure, or difference of latitude and departure, are given, the meaſure of each is to be taken from a ſcale of equal parts, is to be laid off on its reſpective line, and the extremities connected. Hence the figure will be formed.

Prob. I. Given the courſe and diſtance, to find the difference of latitude and departure.

Example. A ſhip from St Helena, in latitude 15° 55′ S. ſailed S. W. by S. 158 miles. Required the latitude come to, and departure?

By Conſtruction.

Draw the meridian AB (fig. 2.), and with the chord of 60° deſcribe the arch *m n*, and make it equal to the rhumb of 3 points, and through *e* draw AC equal to 158 miles; from C draw CB perpendicular to AB; then AB applied to the ſcale from which AC was taken, will be found to meaſure 131.4 and BC 87.8.

By Calculation.

To find the difference of latitude.

As radius - - -		10.00000
is to the co-sine of the courſe	3 points	9.91985
ſo is the diſtance -	158	2.19866
to the difference of latitude	131.4	2.11851

To find the departure.

As radius - - -		10.00000
is to the ſine of the courſe	3 points	9.74474
ſo is the diſtance -	158	2.19866
to the departure -	87.8	1.94340

By Inſpection.

In the traverſe table, the difference of latitude anſwering to the courſe 3 points, and diſtance 158 miles, in a diſtance column is 131.4, and departure 87.8.

By Gunter's Scale.

The extent from 8 points to 5 points, the complement of the courſe on the line of ſine rhumbs (marked SR.) will reach from the diſtance 158 to 131.4, the difference of latitude on the line of numbers; and the extent from 8 points to 3 points on ſine rhumbs, will reach from 158 to 87.8, the departure on numbers.

Latitude St Helena	=	15° 55′ S.
Difference of latitude	-	2 11 S.
Latitude come to	-	18 6 S.

Prob. II. Given the courſe and difference of latitude, to find the diſtance and departure.

Example. A ſhip from St George's, in latitude 38° 45′ north, ſailed SE½S; and the latitude by obſervation was 35° 7′ N. Required the diſtance, run, and departure.

Latitude St George's	-	38° 45′ N.
Latitude come to	-	35 7 N.
Difference of latitude		3 38 = 218 miles.

By Conſtruction.

Draw the portion of the meridian AB (fig. 3.) equal to 218 m. from the centre A with the chord of 60° deſcribe the arch *m n*, which make equal to the chord of 3½ points: through *n* draw the line AC, and from B draw BC perpendicular to AB, and let it be produced till it meets AC in C. Then the diſtance AC being applied to the ſcale will meaſure 282 m. and the departure BC 179 miles.

By Calculation.

To find the diſtance.

As radius - -		10.00000
is to the ſecant of the courſe	3½ points	10.11[illegible]
ſo is the difference of latitude	218 m.	2.[illegible]
to the diſtance -	282	2.45037

To find the departure.

As radius - - -		10.00000
is to the tangent of the courſe	3½ pts.	9.91417
ſo is the difference of latitude	218	2.33846
to the departure -	178.9	2.25253

By Inſpection.

Find the given difference of latitude 218 m. in a latitude column, under the courſe 3½ points; oppoſite to which, in a diſtance column, is 282 miles; and in a departure column is 178.9 m.

By Gunter's Scale.

Extend the compaſſes from 4½ points, the complement of the courſe to 8 points on ſine rhumbs, that extent will reach from the difference of latitude 218 miles to the diſtance 282 miles in numbers; and the extent from 4 points to the courſe 3½ points on the line of tangent rhumbs (marked T. R.) will reach from 218 miles to 178.9, the departure on numbers.

Prob. III. Given courſe and departure, to find the diſtance and difference of latitude.

Example. A ſhip from Palma, in latitude 28° 37′ N ſailed NW by W, and made 192 miles of departure: Required the diſtance, run, and latitude come to?

By Conſtruction.

Make the departure BC (fig. 4.) equal to 192 miles, draw BA perpendicular to BC, and from the centre C, with the chord of 60°, deſcribe the arch *m n*, which make equal to the chord of 3 points, the complement of the courſe; draw a line through C*n*, which produce till it meets BA in A: then the diſtance AC being meaſured, will be equal to 231 m. and the difference of latitude AB will be 128.3 miles.

By Calculation.

To find the diſtance.

As the ſine of the courſe	5 points	9.91985
is to radius - - -		10.00000
ſo is the departure -	192 -	2.28330
to the diſtance -	230.9	2.36345

To find the difference of latitude.

As the tangent of the courſe	5 points	10.17511
is to radius - - -		10.00000
ſo is the departure -	192	2.28330
to the difference of latitude	128.3	2.10819

By Inſpection.

Find the departure 192 m. in its proper column above the given courſe 5 points; and oppoſite thereto is the diſtance 231 miles, and difference of latitude 138.3, in their reſpective columns.

By Gunter's Scale.

The extent from 5 points to 8 points on the line of ſine rhumbs being laid from the departure 192 on numbers, will reach to the diſtance 231 on the ſame line; and the extent from 5 points to 4 points on the line of tangent rhumbs will reach from the departure 192 to the difference of latitude 128.3 on numbers.

Latitude of Palma - -		28° 37′ N
Difference of latitude - -		2 8 N
Latitude come to - -		30 45 N

Prob. IV. Given the diſtance and difference of latitude, to find the courſe and departure.

Example. A ſhip from a place in latitude 43° 13′ N, ſails between the north and eaſt 285 miles; and is then by obſervation found to be in latitude 46° 31′ N: Required the courſe and departure?

Latitude ſailed from	-	43° 13′ N
Latitude by obſervation		46 31 N
Difference of latitude	-	3 18 = 198 miles.

By Conſtruction.

Draw the portion of the meridian AB (fig. 5.) equal to 198 miles; from B draw BC perpendicular to

Plane Sailing.

to AB: then take the distance 285 miles from the scale, and with one foot of the compass in A describe an arch intersecting BC in C, and join AC. With the chord of 60° describe the arch *m n*, the portion of which, contained between the distance and difference of latitude, applied to the line of chords, will measure 46°, the course; and the departure BC being measured on the line of equal parts, will be found equal to 205 miles.

By Calculation.

To find the courſe.

As the diſtance -	285	2.45484
is to the difference of latitude	198	2.29660
ſo is the radius - - -		10.00000
to the coſine of the courſe	46° 0′	9.84176

To find the departure.

As radius - -		10.00000
is to the ſine of the courſe	46° 0′	9.85693
ſo is the diſtance -	285	2.45484
to the departure -	205	2.31177

By Inſpection.

Find the given diſtance in the table in its proper column; and if the difference of latitude anſwering thereto is the ſame as that given, namely 198, then the departure will be found in its proper column, and the courſe at the top or bottom of the page, according as the difference of latitude is found in a column marked *lat.* at top or bottom. If the difference of latitude thus found does not agree with that given, turn over till the neareſt thereto is found to anſwer to the given diſtance. This is in the page marked 46 degrees at the bottom, which is the courſe, and the correſponding departure is 205 miles.

By Gunter's Scale.

The extent from the diſtance 285 to the difference of latitude 198 on numbers, will reach from 90° to 44°, the complement of the courſe on ſines; and the extent from 90° to the courſe 46° on the line of ſines being laid from the diſtance 285, will reach to the departure 205 on the line of numbers.

Prob V. Given the diſtance and departure, to find the courſe and difference of latitude.

Example. A ſhip from Fort-Royal in the iſland of Grenada, in latitude 12° 9′ N, ſailed 260 miles between the ſouth and weſt, and made 190 miles of departure: Required the courſe and latitude come to?

By Conſtruction.

Plate cccxxxvii.

Draw BC (fig 6.) perpendicular to AB, and equal to the given departure 190 miles: then from the centre C, with the diſtance 260 miles, ſweep an arch interſecting AB in it, and join AC. Now deſcribe an arch from the centre A with the chord of 60°, and the portion *m n* of this arch, contained between the diſtance and difference of latitude, meaſured on the line of chords, will be 47° the courſe; and the difference of latitude AB applied to the ſcale of equal parts, meaſures 177 miles.

By Calculation.

To find the courſe.

As the diſtance -	260 -	2.41497
is to the departure	190 -	2.27875
ſo is radius -	-	10.00000
to the ſine of the courſe	46° 57′	9.86378

To find the difference of latitude.

As radius - - -		10.00000
is to the coſine of the courſe	46° 57′	9.83419
ſo is the diſtance -	260	2.41497
to the difference of latitude	177.5	2.24916

By Inſpection.

Seek in the traverſe table until the neareſt to the given departure is found in the ſame line with the given diſtance 260. This is found to be in the page marked 47° at the bottom, which is the courſe; and the correſponding difference of latitude is 177.3.

By Gunter's ſcale.

The extent of the compaſs, from the diſtance 260 to the departure 190 on the line of numbers, will reach from 90° to 47°, the courſe on the line of ſines: and the extent from 90 to 43°, the complement of the courſe on ſines, will reach from the diſtance 260 to the difference of latitude 177½ on the line of numbers.

Latitude Fort-Royal - -			12	9 N
difference of latitude -	177	-	=2	57 S
Latitude in - - -			9	12 N

Prob. VI. Given difference of latitude and departure, ſought courſe and diſtance.

Example. A ſhip from a port in latitude 7° 56′ S, ſailed between the ſouth and eaſt, till her departure is 132 miles; and is then by obſervation found to be in latitude 12° 3′ S. Required the courſe and diſtance?

Latitude ſailed from -	7°	56′ S.
Latitude in by obſervation	12	3 S.
Difference of latitude -	4	7=247.

By Conſtruction.

Draw the portion of the meridian AB (fig. 7.) equal to the difference of latitude 247 miles; from B draw BC perpendicular to AB, and equal to the given departure 132 miles, and join AC: then with the chord of 60° deſcribe an arch from the centre A; and the portion *m n* of this arch being applied to the line of chords, will meaſure about 28°; and the diſtance AC, meaſured on the line of equal parts, will be 280 miles.

By Calculation.

To find the courſe.

As the difference of latitude -	247	2.39270
is to the departure - -	132	2.12057
ſo is radius - - -		10 00000
to the tangent of the courſe -	28° 7′	9.72787

To find the diſtance.

As radius - -		10.00000
is to the ſecant of the courſe	28° 7′	10.05454
ſo is the difference of latitude	247	2.39270
to the diſtance -	280	2.44724

By Inſpection.

Seek in the table till the given difference of latitude and departure, or the neareſt thereto, are found together in their reſpective columns, which will be under 28°, the required courſe; and the diſtance anſwering thereto is 280 miles.

By Gunter's Scale.

The extent from the given difference of latitude 247 to the departure 132 on the line of numbers, will reach from 45° to 28°, the courſe on the line of tangents; and the extent from 62°, the complement of the courſe, to 90° on ſines, will reach from the difference of latitude 247 to the diſtance 280 on numbers.

Chap. III. *Of Traverſe Sailing.*

If a ſhip ſails upon two or more courſes in a given time, the irregular track ſhe deſcribes is called a *traverſe*; and to reſolve a traverſe is the method of reducing theſe ſeveral courſes, and the diſtances run, into a ſingle courſe and diſtance. The method chiefly uſed for this purpoſe at ſea is by inſpection, which ſhall therefore be principally adhered to; and is as follows.

Make a table of a breadth and depth ſufficient to contain the ſeveral courſes, &c. This table is to be divided into ſix columns; the ſeveral courſes are to be put in the firſt, and the correſponding diſtances in the ſecond column; the third and fourth columns are to contain the differences of latitude, and the two laſt the departures.

Now, the ſeveral courſes and their correſponding diſtances being properly arranged in the table, find the difference of latitude and departure anſwering to each in the traverſe table; remembering that the difference of latitude is to be put in a north or ſouth column, according as the courſe is in the northern or ſouthern hemiſphere; and that the departure is to be put in an eaſt column if the courſe is eaſterly, but in a weſt column if the courſe is weſterly: Obſerving alſo, that the departure is leſs than the difference of latitude when the courſe is leſs than 4 points or 45°; otherwiſe greater.

Add up the columns of northing, ſouthing, eaſting, and weſting, and ſet down the ſum of each at its bottom; then the difference between the ſums of the north and ſouth columns will be the difference of latitude made good, of the ſame name with the greater; and the difference between the ſums of the eaſt and weſt columns, is the departure made good, of the ſame name with the greater ſum.

Now ſeek in the traverſe table, till a difference of latitude and departure are found to agree as nearly as poſſible with thoſe above; then the diſtance will be found on the ſame line, and the courſe at the top or bottom of the page according as the difference of latitude is greater or leſs than the departure.

In order to reſolve a traverſe by conſtruction, deſcribe a circle with the chord of 60°, in which draw two diameters at right angles to each other, at whoſe extremities are to be marked the initials of the cardinal points, north being uppermoſt.

Lay off each courſe on the circumference, reckoned from its proper meridian; and from the centre to each point draw lines, which are to be marked with the proper number of the courſe.

On the firſt radius lay off the firſt diſtance from the centre; and through its extremity, and parallel to the ſecond radius, draw the ſecond diſtance of its proper length; through the extremity of the ſecond diſtance, and parallel to the the third radius, draw the third diſtance of its proper length; and thus proceed until all the diſtances are drawn.

A line drawn from the extremity of the laſt diſtance to the centre of the circle will repreſent the diſtance made good: and a line drawn from the ſame point perpendicular to the meridian, produced, if neceſſary, will repreſent the departure; and the portion of the meridian intercepted between the centre and departure will be the difference of latitude made good.

Examples.

I. A ſhip from Fyal, in latitude 38° 32′ N, ſailed as follows: ESE 163 miles, SW ½ W 110 miles, SE ¾ S 180 miles, and N by E 68 miles. Required the latitude come to, the courſe, and diſtance made good?

By Inſpection.

Courſe.	Diſt.	Diff. of Latitude.		Departure	
		N	S	E	W
ESE	163	—	62.4	150.6	—
SW½W	110	—	69.8	—	85.0
SE¾S	180	—	144.5	107.2	—
N*b*E	68	66.7	—	13.3	—
		66.7	276.7	271.1	
			66.7	85.0	
S41½E	281		210.0	186.1	

Latitude left, - 38° 32′ N.
Difference of latitude, 3 21 S.

Latitude come to - 35 11 N.

By Conſtruction.

With the chord of 60° deſcribe the circle NE,SW (fig. 8), the centre of which repreſents the place the ſhip ſailed from: draw two diameters NS, EW at right angles to each other; the one repreſenting the meridian, and the other the parallel of latitude of the place ſailed from. Take each courſe from the line of rhumbs, lay it off on the circumference from its proper meridian, and number it in order 1, 2, 3, 4. Upon the firſt rhumb C1, lay of the firſt diſtance from C to A; through it draw the ſecond diſtance AB parallel to C2, and equal to 110 miles; through B draw BD equal to 180 miles, and parallel to C3; and draw DE parallel to C4, and equal to 68 miles. Now CE being joined, will repreſent the diſtance made good; which applied to the ſcale will meaſure 281 miles. The arch S*n*, which repreſents the courſe, being meaſured on the line of chords, will be found equal to 41½°. From E draw EF perpendicular to CS produced; then CF will be the difference of latitude, and FE the departure made good; which applied to the ſcale will be found to meaſure 210 and 186 reſpectively.

Plate cccxxxvii.

As the method by conſtruction is ſcarcely ever practiſed at ſea, it therefore ſeems unneceſſary to apply it to the ſolution of the following examples.

Traverſe Sailing.

II. A ſhip from latitude 1° 38' S failed as under. Required her preſent latitude, courſe, and diſtance made good?

Courſe.	Diſt.	Diff. of Latitude N	Diff. of Latitude S	Departure. E	Departure. W
NW*b*N	43	35.8	—	—	23.9
WNW	78	29.9	—	—	72.1
SE*b*E	56	—	31.1	46.6	—
WSW¼W	62	—	18.0	—	59.3
N¾E	85	84.1	—	12.5	—
		149.8 49.1	49.1	59.1	155.3 59.1
N 41° W	139	100.7=1° 41'			96.2
Latitude left	-	1 38 S.			
Latitude come to		0 3 N			

III. Yeſterday at noon we were in latitude 13° 12' N, and ſince then have run as follows: SSE 36 miles, S 12 miles, NW¼W 28 miles, W 30 miles, SW 42 miles, W*b*N 39 miles, and N 20 miles. Required our preſent latitude, departure, and direct courſe and diſtance?

Courſes.	Diſt.	Diff. of Latitude. N	Diff. of Latitude. S	Departure. E	Departure. W
SSE	36	—	33.3	13.8	—
S	12	—	12.0	—	—
NW¼W	28	17.8	—	—	21.6
W	30	—	—	—	30.0
SW	42	—	29.7	—	29.7
W*b*N	39	7.6	—	—	38.2
N	20	20.0	—	—	—
		45.4	75.0 45.4	13.8	119.5 13.8
S 74° W	110		29.6=0° 30'		105.7
Yeſterday's latitude	-	13 12 N			
Preſent latitude	-	12 42 N			

IV. The courſe per compaſs from Greigſneſs to the May is SW¼S. diſtance 58 miles: from the May to the Staples S*b*E¾E. 44 miles; and from the Staples to Flamborough Head S¼E, 110 miles. Required the courſe per compaſs, and diſtance from Greigſneſs to Flamborough Head?

Courſes.	Diſt.	Diff. of Latitude. N	Diff. of Latitude. S	Departure. E	Departure. W
SW¼S	58	—	43.6	—	38.9
S*b*E¾E	44	—	41.4	14.8	—
S¼E	110	—	107.9	21.5	—
			192.3	36.3	38.9 36.3
					2.6

Hence the courſe per compaſs is S 1° E, and diſtance 110 miles.

Chap. IV. *Of Parallel Sailing.*

Parallel Sailing.

The figure of the earth is ſpherical, and the meridians gradually approach each other, and meet at the poles. The difference of longitude between any two places is the angle at the pole contained between the meridians of thoſe places; or it is the arch of the equator intercepted between the meridians of the given places; and the meridian diſtance between two places in the ſame parallel, is the arch thereof contained between their meridians. It hence follows, that the meridian diſtance, anſwering to the ſame difference of longitude, will be variable with the latitude of the parallel upon which it is reckoned; and the ſame difference of longitude will not anſwer to a given meridian diſtance when reckoned upon different parallels.

Parallel ſailing is therefore the method of finding the diſtance between two places lying in the ſame parallel whoſe longitudes are known; or, to find the difference of longitude anſwering to a given diſtance, run in an eaſt or weſt direction. This ſailing is particularly uſeful in making low or ſmall iſlands.

Plate CCCXXVII.

In order to illuſtrate the principles of parallel ſailing, let CABP (fig. 9.) repreſent a ſection of one fourth part of the earth, the arch ABP being part of a meridian; CA the equatorial; and CP the polar ſemiaxis. Alſo let B be the ſituation of any given place on the earth; and join BC, which will be equal to CA or CP (A). The arch AB, or angle ACB, is the meaſure of the latitude of the place B; and the arch BP, or angle BCP, is that of its complement. If BD be drawn from B perpendicular to CP, it will repreſent the coſine of latitude to the radius BC or CA.

Now ſince circles and ſimilar portions of circles are in the direct ratio of their radii; therefore,

As radius
Is to the coſine of latitude;
So is any given portion of the equator
To a ſimilar portion of the given parallel.

But

(A) This is not ſtrictly true, as the figure of the earth is that of an oblate ſpheroid; and therefore the radius of curvature is variable with the latitude. The difference between CA and CP, according to Sir Iſaac Newton's hypotheſis, is about 17 miles.

But the difference of longitude is an arch of the equator; and the diſtance between any two places under the ſame parallel, is a ſimilar portion of that parallel.

Hence R : coſine latitude :: Diff. longitude : Diſtance.

And by inverſion,

Coſine latitude : R :: Diſtance : Diff. of longitude.

Alſo,

Diff. of longitude : Diſtance :: R : coſ. latitude.

Prob. I. Given the latitude of a parallel, and the number of miles contained in a portion of the equator, to find the miles contained in a ſimilar portion of that parallel.

Example I. Required the number of miles contained in a degree of longitude in latitude 55° 58'?

By Conſtruction.

Plate CCCXXXVII.

Draw the indefinite right line AB (fig. 10.); make the angle BAC equal to the given latitude 55° 58', and AC equal to the number of miles contained in a degree of longitude at the equator, namely 60: from C draw CB perpendicular to AB; and AB being meaſured on the line of equal parts, will be found equal to 33. 5, the miles required.

By Calculation.

As radius - - -		10.00000
is to the coſine of latitude,	55° 58'	9.74794
ſo is miles in a deg. of long. at eq.	60	1.77815
to the miles in deg. in the given par.	33.58	1.52609

By Inſpection.

To 56°, the neareſt degree to the given latitude, and diſtance 60 miles, the correſponding difference of latitude is 33.6, which is the miles required.

By Gunter's Scale.

The extent from 90° to 34°, the complement of the given latitude on the line of ſines, will reach from 60 to 33.6 on the line of numbers.

There are two lines on the other ſide of the ſcale, with reſpect to Gunter's line, adapted to this particular purpoſe; one of which is entitled *chords*, and contains the ſeveral degrees of latitude: The other, marked M. L. ſignifying *miles of longitude*, is the *line of longitude*, and ſhows the number of miles in a degree of longitude in each parallel. The uſe of theſe lines is therefore obvious.

Example II. Required the diſtance between Treguier in France, in longitude 3° 14' W. and Gaſpey Bay, in longitude 64° 27' W. the common latitude being 48° 47' N?

Longitude Treguier -	3°	14'	W
Longitude Gaſpey Bay	64	27	W
Difference of longitude	61	13=3673'	

As radius - -		10.00000
is to the coſine of latitude,	48 47	9.81882
ſo is the difference of longitude	3673	3.56502
to the diſtance -	2420	3. 8384

Prob. II. Given the number of miles contained in a portion of a known parallel, to find the number of miles in a ſimilar portion of the equator.

Example. A ſhip from cape Finiſterre, in latitude 42° 52' N, and longitude 9° 17' W, ſailed due weſt 342 miles. Required the longitude come to?

By Conſtruction.

Draw the ſtraight line AB (fig. 11.) equal to the given diſtance 342 miles, and make the angle BAC equal 42° 52, the given latitude: from B draw BC perpendicular to AB, meeting AC in C; then AC applied to the ſcale will meaſure 466½, the difference of longitude required.

By Calculation.

As radius - -		10.00000
is to the ſecant of latitude	42° 52'	10.13493
ſo is the diſtance -	342	2.53403
to the difference of longitude	466.6	2.66896

By Inſpection.

The neareſt degree to the given latitude is 43°; under which, and oppoſite to 171, half the given diſtance in a latitude column, is 234 in a diſtance column, which doubled gives 468, the difference of longitude.

If the proportional part anſwering to the difference between the given alitude and that uſed be applied to the above, the ſame reſult with that found by calculation will be obtained.

By Gunter's Scale.

The extent from 47° 8, the complement of latitude to 90° on the line of ſines, being laid the ſame way from the diſtance 342, will reach to the difference of longitude 466½ on the line of numbers.

Longitude Cape Finiſterre -	9°	17'	W
Difference of longitude -	7	47	W
Longitude come to -	17	4	W

Prob. III. Given the number of miles contained in any portion of the equator, and the miles in a ſimilar portion of a parallel, to find the latitude of that parallel.

Example. A ſhip ſailed due eaſt 358 miles, and was found by obſervation to have differed her longitude 8° 42'. Required the latitude of the parallel?

By Conſtruction.

Make the line AB (fig. 12.) equal to the given diſtance; to which let BC be drawn perpendicular, with an extent equal to 522', the difference of longitude; deſcribe an arch from the centre A cutting BC in C; then the angle BAC being meaſured by means of the line of chords, will be found equal to 46°⅔, the required latitude.

By Calculation.

As the diſtance -	358	2.55388
is to the difference of longitude,	522	2.71767
ſo is radius - - -		10 00000
to the ſecant of the latitude	46° 42'	10.16379

By Inſpection.

As the difference of longitude and diſtance exceed the limits of the table, let therefore the half of each be taken; theſe are 261 and 179 reſpectively. Now, by entering the table with theſe quantities, the latitude will be found to be between 46 and 47 degrees. Therefore, to latitude 46°, and diſtance 261 miles, the correſponding difference of latitude is 181'.3, which exceeds the half of the given diſtance by 2'.3. Again, to latitude 47°, and diſtance 261, the difference of latitude is 178.0, being 1.0 leſs than the half of that given: therefore the change of diſtance anſwering to a change of 1° of latitude is 3'.3.

Now, as 3'.3 : 2'.3 :: 1° : 42'

Hence the latitude required is 46° 42'.

By Gunter's Scale.

The extent from 522 to 358 on the line of numbers, will reach from 90° to about 43½°, the complement of which 46½ is the latitude required?

Prob. IV. Given the number of miles contained in the portion of a known parallel, to find the length of a similar portion of another known parallel.

Epample. From two parts in latitude 33° 58′ N, distance 348 miles, two ſhips ſail directly north till they are in latitude 48° 23′ N. Required their diſtance?

By Conſtruction.

Plate CCCXXXVII.

Draw the lines CB, CE (fig. 13.), making angles with CP equal to the complements of the given latitudes, namely, 56° 2′ and 41° 37′ reſpectively: make BD equal to the given diſtance 348 miles, and perpendicular to CP; now from the centre C, with the radius CB, deſcribe an arch interſecting CE in E; then EF drawn from the point E, perpendicular to CP, will repreſent the diſtance required; and which being applied to the ſcale, will meaſure 278½ miles.

By Calculation.

As the coſine of the latitude left	33° 58′	9.91874
is to the coſine of the latitude come to -	48 23	9.82226
ſo is the given diſtance -	348	2.54158
to the diſtance required -	278.6	2.44510

By Inſpection.

Under 34°, and oppoſite to 174, half the given diſtance in a latitude column is 210 in a diſtance column; being half the difference of longitude anſwering thereto. Now, find the difference of latitude to diſtance 210 miles over 48° of latitude, which is 140′.5; from which 1′.1 (the proportional part anſwering to 23 minutes of latitude) being ſubtracted, gives 139′.4, which doubled is 278′.8, the diſtance required.

By Gunter's Scale.

The extent from 56° 2′, the complement of the latitude left, to 41° 37′, the complement of that come to on the line of ſines, being laid the ſame way from 348, will reach to 278½, the diſtance ſought on the line of numbers.

Prob. V. Given a certain portion of a known parallel, together with a ſimilar portion of an unknown parallel, to find the latitude of that parallel.

Example. Two ſhips, in latitude 56° 0′ N, diſtant 180 miles, ſail due ſouth; and having come to the ſame parallel, are now 232 miles diſtant. The latitude of that parallel is required?

By Conſtruction.

Make DB (fig. 14.) equal to the firſt diſtance 180 miles, DM equal to the ſecond 232, and the angle DBC equal to the given latitude 56°; from the centre C, with the radius CB, deſcribe the arch BE; and through M draw ME parallel to CD, interſecting the arch BE in E, join EC and draw EF perpendicular to CD: then the angle FEC will be the latitude required; which being meaſured, will be found equal to 43° 53′.

By Calculation.

As the diſtance on the known parallel - -	180	2.25527
is to the diſtance on that required	232	2.36549
ſo is the coſine of the latitude left	56° 0′	9.74756
to the coſine of the latitude come to - -	43 53	9.85778

By Inſpection.

To latitude 56°, and half the firſt diſtance 90 in a latitude column, the correſponding diſtance is 161, which is half the difference of longitude. Now 161, and 116 half the ſecond diſtance, are found to agree between 43 and 44 degrees; therefore, to latitude 43° and diſtance 161, the correſponding difference of latitude is 117′.7; the exceſs of which above 116′ is 1′.7: and to latitude 44°, and diſtance 161, the difference of latitude is 115′.8: hence 117.7—115.8 =1′.9, the change anſwering to a change of 1° of latitude.

There 1′.9 : 1′.7 :: 1° : 53′
Hence the latitude is 43° 53′.

By Gunter's Scale.

The extent from 180 to 232 on the line of numbers, being laid in the ſame direction on the line of ſines, from 34°, the complement of the latitude ſailed from, will reach to 46° 7′, the complement of the latitude come to.

Chap. V. *Of Middle Latitude Sailing.*

The earth is a ſphere, and the meridians meet at the poles; and ſince a rhumb-line makes equal angles with every meridian, the line a ſhip deſcribes is therefore that kind of a curve called a *ſpiral*.

Let AB (fig. 15.) be any given diſtance ſailed upon an oblique rhumb, PBN, PAM the extreme meridians, MN a portion of the equator, and PCK, PEL two meridians interſecting the diſtance AB in the points CE infinitely near each other. If the arches BS, CD, and AR, be deſcribed parallel to the equator, it is hence evident, that AS is the difference of latitude, and the arch MN of the equator the difference of longitude, anſwering to the given diſtance AB and courſe PAB.

Now, ſince CE repreſents a very ſmall portion of the diſtance AB, DE will be the correſpondent portion of a meridian: hence the triangle EDC may be conſidered as rectilineal. If the diſtance be ſuppoſed to be divided into an infinite number of parts, each equal to CE, and upon theſe, triangles be conſtructed whoſe ſides are portions of a meridian and parallel, it is evident theſe triangles will be equal and ſimilar; for, beſides the right angle, and hypothenuſe which is the ſame in each, the courſe or angle CED is alſo the ſame. Hence, by the 12th of V. Euc. the ſum of all the hypothenuſes CE, or the diſtance AB, is to the ſum of all the ſides DE, or the difference of latitude AS, as one of the hypothenuſes CE is to the correſponding ſide DE. Now, let the triangle GIH (fig. 16.) be conſtructed ſimilar to the triangle CDE, having the angle G equal to the courſe: then as GH : GI :: CE : DC :: AB : AS.

Hence, if GH be made equal to the given diſtance AB, then GI will be the correſponding difference of latitude.

In like manner, the ſum of all the hypothenuſes CE, or the diſtance AB, is to the ſum of all the ſides CD,

Middle Latitude Sailing.

CD, as CE is to CD, or as GH to HI, becauſe of the ſimilar triangles.

The ſeveral parts of the ſame rectilineal triangle will therefore repreſent the courſe, diſtance, difference of latitude, and departure.

Although the parts HG, GI, and angle G of the rectilineal triangle GHI, are equal to the correſponding parts AB, AS, and angle A, of the triangle ASB upon the ſurface of the ſphere; yet HI is not equal to BS, for HI is the ſum of all the arcs CD; but CD is greater than OQ, and leſs than ZX: therefore HI is greater than BS, and leſs than AR. Hence the difference of longitude MN cannot be inferred from the departure reckoned either upon the parallel ſailed from or on that come to, but on ſome intermediate parallel TV, ſuch that the arch TV is exactly equal to the departure: and in this caſe the difference of longitude would be eaſily obtained. For TV is to MN as the ſine PT to the ſine PM; that is, as the coſine of latitude is to the radius.

The latitude of the parallel TV is not, however, eaſily determined with accuracy; various methods have therefore been taken in order to obtain it nearly, with as little trouble as poſſible: firſt, by taking the arithmetical mean of the two latitudes for that of the mean parallel: ſecondly, by uſing the arithmetical mean of the coſines of the latitudes: thirdly, by uſing the geometrical mean of the coſines of the latitudes: and laſtly, by employing the parallel deduced from the mean of the meridional parts of the two latitudes. The firſt of theſe methods is that which is generally uſed.

Plate cccxxxvii.

In order to illuſtrate the computations in middle latitude ſailing, let the triangle ABC (fig. 17.) repreſent a figure in plain ſailing, wherein AB is the difference of latitude, AC the diſtance, BC the departure, and the angle BAC the courſe. Alſo let the triangle DBC be a figure in parallel ſailing, in which DC is the difference of longitude, BC the meridian diſtance, and the angle DCB the middle latitude. In theſe triangles there is therefore one ſide BC common to both; and that triangle is to be firſt reſolved in which two parts are given, and there the unknown parts of the other triangle will be eaſily obtained.

Prob. I. Given the latitudes and the longitudes of two places, to find the courſe and diſtance between them.

Example. Required the courſe and diſtance from the iſland of May, in latitude 56° 12′ N, and longitude 2° 37′ W, to the Naze of Norway, in latitude 57° 50′ N, and longitude 7° 27′ E?

Latitude Iſle of May	56° 12′ N	-	56° 12′
Latitude Naze of Norway	57 50 N	-	57 50
Difference of latitude	1. 38=98′		114. 2
Middle latitude	- -	-	57. 1

Longitude Iſle of May	-	2 37 W
Longitude Naze of Norway	-	7 27 E
Difference of longitude	-	10 7 = 604

By Conſtruction.

Draw the right line AD (fig. 18.) to repreſent the meridian of the May; with the chord of 60° deſcribe the arch *m n*, upon which lay off the chord of 32° 59, the complement of the middle latitude from *m* to *n*: from D through *n* draw the line DC equal to 604, the difference of longitude, and from C draw CB perpendicular to AC: make BA equal to 98′, the difference of latitude, and join AC; which applied to the ſcale will meaſure 343 miles, the diſtance ſought: and the angle A being meaſured by means of the line of chords, will be found equal to 73° 24′, the required courſe.

By Calculation.

To find the courſe (b).

As the difference of latitude -	98′ -	1.99123
is to the difference of longitude	604	2.78104
ſo is the coſine of middle latitude - -	57° 1′	9.73591
to the tangent of the coſine	73 24	10.52572

To find the diſtance.

As radius - - -		10.00000
is to the ſecant of the courſe	73° 24′	10.54411
ſo is the difference of latitude	98′	1.99123
to the diſtance - -	343	2.53534

By Inſpection.

To middle latitude 57°, and 151 one-fourth of the difference of longitude in a diſtance column, the correſponding difference of latitude is 82.2.

Now 24.5, one-fourth of the difference of latitude, and 82.2, taken in a departure column, are found to agree neareſt on table marked 6½ points at the bottom, which is the coſine; and the correſponding diſtance 85¾ multiplied by 4 gives 343 miles, the diſtance.

By Gunter's Scale.

The extent from 98 the difference of latitude, to 604 the difference of longitude on numbers, being laid the ſame way from 33°, the complement of the middle latitude on ſines, will reach to a certain point beyond the termination of the lines on the ſcale. Now the extent between this point and 90° on ſines, will reach from 45° to 73° 24′, the courſe on the line of tangents. And the extent from 73° 24′ the courſe, to 33° the complement of the middle latitude on the line of ſines, being laid the ſame way from 604 the difference of longitude, will reach to 343 the diſtance on the line of numbers.

The true courſe, therefore, from the iſland of May to the Naze of Norway is N 73° 24 E, or ENE½E nearly; but as the variation at the May is 2¼ points weſt,

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(b) For R. : coſine Mid. lat. : : Diff. of long. : Departure;
And diff. of lat. : Dep. : : R. : Tangent courſe.
Hence diff. of lat. : coſine mid. lat. : : diff. of long. : tang. courſe.
Or diff. of lat. : diff. of long. : : coſine mid. lat. : tang. courſe.

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weſt, therefore the courſe *per* compaſs from the May is E·S.

Prob. II. Given one latitude, courſe, and diſtance ſailed, to find the other latitude and difference of longitude.

Example. A ſhip from Breſt, in latitude 48° 23′ N. and longitude 4° 30′ W. ſailed SW¾W 238 miles. Required the latitude and longitude come to?

By *Conſtruction.*

With the courſe and diſtance conſtruct the triangle ABC (fig. 17.), and the difference of latitude AB being meaſured, will be found equal to 142 miles: hence the latitude come to is 46° 1′ N, and the middle latitude 47° 12′. Now make the angle DCB equal to 47° 12′; and DC being meaſured, will be 281, the difference of longitude: hence the longitude come to is 9° 11′ W.

Plate CCCXXXVII

By *Calculation.*

To find the difference of latitude,

As radius - -	-	10.00000
is to the co-ſine of the courſe,	4¾	9.77503
ſo is the diſtance, -	238	2.37658
to the difference of latitude	141.8	2.15161

Latitude of Breſt,	48° 23′ N.		48° 23′ N.
Difference of Lat.	2 22 S.	half	1 11 S.
Lat. come to	46° 1′ N.	Mid. Lat.	47 12

To find the difference of longitude (D).

As the co-ſine of Mid. Lat.	47° 12′	9.83215
is to the ſine of the courſe	4¾ points	9.90483
ſo is the diſtance	238	2.37658
to the difference of longitude	281.3	2.44926
Longitude of Breſt -	-	4° 30′ W.
Difference of longitude -	-	4 41 W.
Longitude come to -	-	9 11 W.

By *Inſpection.*

To the courſe 4¾ points, and diſtance 238 miles, the difference of latitude is 141.8, and the departure 191.1. Hence the latitude come to is 46° 1′ N, and middle latitude 47° 12′. Then to middle latitude 47° 12′, and departure 191.1 in a latitude column, the correſponding diſtance is 281, which is the difference of longitude.

By *Gunter's Scale.*

The extent from 8 points to 3¼ points, the complement of the courſe on ſine rhumbs, being laid the ſame way from the diſtance 238, will reach to the difference of latitude 142 on the line of numbers; and the extent from 42° 48′ the complement of the middle latitude, to 53° 26′, the courſe on the line of ſines will reach from the diſtance 238 to the difference of longitude 281 on numbers.

Prob. III. Given both latitudes and courſe, required the diſtance and difference of longitude?

Example. A ſhip from St Antonio, in latitude 17° 0′ N, and longitude 24° 25′ W, ſailed NW¾N, till by obſervation her latitude is found to be 28° 34′ N. Required the diſtance ſailed, and longitude come to?

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Latitude St Antonio	17° 0′ N.	17° 0′ N.
Latitude by obſervation	28 34 N.	28 34 N.
Difference of lat.	11 34=694m	45 34
	Middle lat.	22 47

By *Conſtruction.*

Conſtruct the triangle ABC (fig. 19.), with the given courſe and difference of latitude, and make the angle BCD equal to the middle latitude. Now the diſtance AC and difference of longitude DC being meaſured, will be found equal to 864 and 558 reſpectively.

By *Calculation.*

To find the diſtance.

As radius, -	-	10.00000
Is to the ſecant of the courſe	3¼ points	10.09517
So is the difference of lat.	694	2.84136
To the diſtance -	864	2.93653

To find the difference of longitude.

As the coſine of middle latitude	22° 47′	9.96472
Is to the tangent of the courſe	3¼ points	9.87020
So is the difference of latitude	694	2.84136
To the difference of longitude	558.3	2.74684
Longitude of St Antonio	-	24° 25 W.
Difference of longitude,	-	9 18 W.
Longitude come to -	-	33 43 W.

By *Inſpection.*

To courſe 3¼ points, and difference of latitude 231.3 one third of that given, the departure is 171.6, and diſtance 288, which multiplied by 3 is 864 miles.

Again to the middle latitude 22° 47′, or 23°, and departure 171.6 in a latitude column, the diſtance is 186, which multiplied by 3 is 558, the difference of longitude.

By *Gunter's Scale.*

The extent from 4¾ points, the complement of the courſe, to 8 points on the line of ſine rumbs, will reach from the difference of latitude 694 to the diſtance 864 on numbers; and the extent from the courſe 36° 34′ to 67° 13′, the complement of middle latitude on ſines, will reach from the diſtance 864 to the difference of longitude 558 on numbers.

Prob. IV. Given one latitude, courſe, and departure, to find the other latitude, diſtance, and difference of longitude.

Example. A ſhip from latitude 26° 30′ N. and longitude 45° 30′ W. ſailed NE½N. till her departure is 216 miles. Required the diſtance run, and latitude and longitude come to?

By *Conſtruction.*

With the courſe and departure conſtruct the triangle ABC (fig. 20.), and the diſtance and difference of latitude being meaſured, will be found equal to 340 and 263 reſpectively. Hence the latitude come to is 30° 53′ and middle latitude 28° 42′. Now make the angle BCD equal to the middle latitude, and the difference of longitude DC applied to the ſcale will meaſure 246′.

By

(D) This proportion is obvious, by conſidering the whole figure as an oblique angled triangle.

Middle Latitude Sailing.

By Calculation.

To find the diſtance.

As the ſine of the courſe	3½ points	9.80236
Is to radius	- - -	10.00000
So is the departure	216	2.33445
To the diſtance	340.5	2.53209

To find the difference of latitude.

As the tangent of the courſe	3½ points	9.91417
is to radius	- - -	10.00000
ſo is the departure	216	2.33445
to the difference of lat.	263.2	2.42028
Latitude ſailed from	26° 30′ N.	26° 30′ N.
Difference of latitude	4 23 N. half	2 12 N.
Latitude come to	30 53 N.	Mid. lat. 28 42

To find the difference of longitude.

As radius	- -	10.00000
is to the ſecant of the mid. lat.	28° 42′	10.05693
ſo is the departure	216	2.33445
to the difference of longitude	246.2	2.39138
Longitude left,	- -	45° 30′ W.
Difference of longitude	-	4 6 E.
Longitude come to	- -	41 24 W.

By Inſpection.

Under the courſe 3½ points, and oppoſite to 108 half the departure, the diſtance is 170, and difference of latitude 131½; which doubled, give 340 and 263 for the diſtance and difference of latitude reſpectively.

Again, to middle latitude 28° 42′, and departure 108, the diſtance is 123: which doubled is 246 the difference of longitude.

By Gunter's Scale.

The extent from the courſe 3½ points, on ſine rhumbs, to the departure 216 on numbers, will reach from 8 points on ſine rhumbs to about 340, the diſtance on numbers; and the ſame extent will reach from 4½ points, the complement of the courſe, to 263, the difference of latitude on numbers; and the extent from 61° 18′ the complement of the middle latitude, to 90° on ſines, will reach from the departure 216 to the difference of longitude 246 on numbers.

Prob. V. Given both latitudes and diſtance; to find the courſe and difference of longitude.

Example. From Cape Sable, in latitude 43° 24′ N. and longitude 65° 39′ W. a ſhip ſailed 246 miles on a direct courſe between the ſouth and eaſt, and is then by obſervation in latitude 40° 48′ N. Required the courſe and longitude in?

Latitude Cape Sable,	43 48 N.	43° 24 N.
Latitude by obſervation,	40 48 N.	40 48 N.
Difference of latitude,	2 56 = 156′	24 12
	Middle latitude	42 6

By Conſtruction.

Plate CCCXXXVII

Make AB (fig. 21.) equal to 156 miles; draw BC perpendicular to AB, and make AC equal to 246 miles. Draw CD, making with CB an angle of 42° 6′ the middle latitude. Now DC will be found to meaſure 256, and the courſe or angle A will meaſure 50° 39′.

By Calculation.

To find the courſe.

As the diſtance	246	2.39093
is to the difference of latitude	156	2.19312
ſo is radius,	- - -	10.00000
to the coſine of the courſe	50° 39′	9.80219

To find the difference of longitude.

As the coſine of middle latitude	42° 6′	9.87039
is to the ſine of the courſe	50 39	9.88834
ſo is the diſtance	246	2.39093
to the difference of longitude	256.4	2.40888
Longitude Cape Sable,	-	65° 39′ W.
Difference of longitude	- -	4 16 E.
Longitude come to	- -	61 23 W.

By Inſpection.

The diſtance 246, and difference of latitude 156, are found to correſpond above 4½ points, and the departure is 193.1. Now, to the middle latitude 42°, and departure 190.1 in a latitude column, the correſponding diſtance is 256, which is the difference of longitude required.

By Gunter's ſcale.

The extent from 246 miles, the diſtance to 156, the difference of latitude on numbers, will reach from 90° to about 39°⅓, the complement of the courſe on the line of ſines: and the extent from 48°, the complement of the middle latitude, to 50°⅔, the courſe on ſines, will reach from the diſtance 246m to the difference of longitude 256m on numbers.

Prob. VI. Given both latitudes and departure; ſought the courſe, diſtance, and difference of longitude.

Example. A ſhip from Cape St Vincent, in latitude 37° 2′ N. longitude 9° 2′ W. ſails between the ſouth and weſt; the latitude come to is 18° 16′ N, and departure 838 miles. Required the courſe and diſtance run, and longitude come to?

Latitude Cape St Vincent,	37° 2′ N.	37° 2′
Latitude come to	18 16 N.	18 16
Difference of latitude	18 46 = 1126	55 18
	Middle latitude	27 39

By Conſtruction.

Make AB (fig. 22.) equal to the difference of latitude 1126 miles, and BC equal to the departure 838, and join AC; draw CD ſo as to make an angle with CB equal to the middle latitude 27° 39′. Then the courſe being meaſured on chords is about 36°⅔, and the diſtance and difference of longitude, meaſured on the line of equal parts, are found to be 1403 and 946 reſpectively.

By Calculation.

To find the courſe.

As the difference of latitude	1126	3.05154
is to the departure	838	2.92324
ſo is radius	- - -	10.00000
to the tangent of the courſe	36° 39′	9.87170

To find the diſtance.

As radius - - -		10.00000
is to the ſecant of the courſe	36° 39′	10.09566
ſo is the difference of latitude	1126	3.05154
to the diſtance -	1403	3.14720

To find the difference of longitude.

As radius - - -		10.00000
is to the ſecant of the mid. lat.	27° 39′	10.05266
ſo is the departure -	838	2.92324
to the difference of longitude	946	2.97590
Longitude Cape St Vincent -		9° 2′W.
Difference of longitude - -		15 46W.
Longitude come to - -		24 48W.

By Inſpection.

One-tenth of the difference of latitude 112.6, and of the departure 83.8, are found to agree under 3¼ points, and the correſponding diſtance is 140, which multiplied by 10 gives 1400 miles. And to middle latitude 27°⅔, and 209.5 one fourth of the departure in a latitude column, the diſtance is 236.5; which multiplied by 4 is 946, the difference of longitude.

By Gunter's Scale.

The extent from the difference of latitude 1126 to the departure 838 on numbers, will reach from 45° to 36°⅔ the courſe on tangents; and the extent from 53°⅓ the complement of the courſe to 90° on ſines, will reach from 1126 to 1403 the diſtance on numbers. Laſtly, the extent from 62°⅓ the complement of the middle latitude, to 90° on ſines, will reach from the departure 838 to the difference of longitude 946 on numbers.

Prob. VII. Given one latitude, diſtance, and departure, to find the other latitude, courſe, and difference of longitude.

Example. A ſhip from Bourdeaux, in latitude 44° 50′ N, and longitude 0° 35′ W, ſailed between the north and weſt 374 miles, and made 210 miles of weſting. Required the courſe and latitude and longitude come to?

By Conſtruction.

With the given diſtance and departure make the triangle ABC (fig. 23.) Now the courſe being meaſured on the line of chords is about 34°⅙, and the difference of latitude on the line of numbers is 309 miles: hence the latitude come to, is 49° 59′ N, and middle latitude 47° 25′. Then make the angle BCD equal to 47° 25′, and DC meaſured will be 310 miles, the difference of longitude.

Plate cccxxxvii.

By Calculation.

To find the courſe.

As the diſtance -	374	2.57287
is to the departure -	210	2.32222
ſo is radius - - -		10.00000
to the ſine of the courſe	34° 10′	9.74935

To find the difference of latitude.

As radius - -		10.00000
is to the coſine of the courſe	34° 10′	9.91772
ſo is the diſtance -	374	2.57287
to the difference of latitude	309.4	2.49059

Latitude Bourdeaux	44° 50′ N	-	44° 50′
Difference of latitude	5 9 N	half -	2 35
Latitude come to	49 59 N	Mid. lat.	47 25

To find the difference of longitude.

As radius - -		10.00000
is to the ſecant of middle latitude	47° 25′	10.16963
ſo is the departure -	210 -	2.32222
to the difference of longitude	310.3	2.49185
Longitude of Bourdeaux -		0° 35′ W
Difference of longitude - -		5 10 W
Longitude in - - -		5 45 W

By Inſpection.

The half of the diſtance 187, and of the departure 105, are found to agree neareſt under 34°, and the difference of latitude anſwering thereto is 155; which doubled is 310 miles.

Again, to middle latitude 47° 25′, and departure 105 in a latitude column, the correſponding diſtance is 155 miles, which doubled is 310 miles, the difference of longitude.

By Gunter's Scale.

The extent from the diſtance 374 miles to the departure 210 miles on the line of numbers, will reach from 90° to 34° 10′, the courſe on the line of ſines; and the extent from 90° to 55° 50′, the complement of the courſe on ſines, will reach from the diſtance 374 to the difference of latitude 309 miles on numbers.

Again, the extent from 42° 35′, the complement of the middle latitude, to 90° on ſines, will reach from the departure 210 to the difference of longitude 310 on numbers.

Prob. VIII. Given one latitude, departure, and difference of longitude, to find the other latitude, courſe, and diſtance.

Example. A ſhip from latitude 54° 56′ N, longitude 1° 10 W, ſailed between the north and eaſt, till by obſervation ſhe is found to be in longitude 5° 26′ E, and has made 220 miles of eaſting. Required the latitude come to, courſe, and diſtance run?

Longitude left - -	1° 10′ W
Longitude come to - -	5 26 E
Difference of longitude -	6 36 = 396

By Conſtruction.

Make BC (fig. 24.) equal to the departure 220, and CD equal to the difference of longitude 396:—then the middle latitude BCD being meaſured, will be found equal to 56° 15′: hence the latitude come to is 57° 34′, and difference of latitude 158°. Now make AB equal to 158, and join AC, which applied to the ſcale, will meaſure 271 miles. Alſo the courſe BAC being meaſured on chords will be found equal 54⅓.

By Calculation.

To find the middle latitude.

As the departure -	220 -	2.34242
is to the difference of longitude -	396 -	2.59769
ſo is radius - - -		10.00000

to

Middle Latitude Sailing.

to the ſecant of the middle latitude -	56° 15′	-	10.25527
Double the middle latitude	112 30		
Latitude left -	54 56		
Latitude come to -	57 34		
Difference of latitude -	2 38 = 158		

To find the courſe.

As the difference of latitude	158	-	2.19866
is to the departure -	220	-	2.34242
ſo is radius -	-		10.00000
to the tangent of the courſe	54° 19′		10.14376

To find the diſtance.

As radius -	-	-	10.00000
is to the ſecant of the courſe	54° 19′		10.23410
ſo is the difference of latitude	158	-	2.19866
to the diſtance -	270.9	-	2.43276

By Inſpection.

As the difference of longitude and departure exceed the limits of the tables, let therefore their halves be taken; theſe are 198 and 110 reſpectively. Now theſe are found to agree exactly in the page marked 5 points at the bottom. Whence the middle latitude is 56° 15′, and difference of latitude 158 miles.

Again the difference of latitude 158 and departure 220 will be found to agree nearly above 54° the courſe, and the diſtance on the ſame line is 271 miles.

By Gunter's Scale.

The extent from the difference of longitude 396 to the departure 220 on numbers, will reach from 90° to 33° 45′, the complement of the middle latitude on ſines; and hence the difference of latitude is 158 miles. Now the extent from 158 to 220 on numbers, will reach from 45° to 54°⅓ on tangents; and the extent from the complement of the courſe 35°⅔ to 90° on ſines, will reach from the difference of latitude 158 to the diſtance 271 on numbers.

Prob. IX. Given the courſe and diſtance ſailed, and difference of longitude; to find both latitudes.

Example. A ſhip from a port in north latitude, ſailed SE¼S 438 miles, and differed her longitude 7° 28′. Required the latitude ſailed from, and that come to?

By Conſtruction.

Plate CCCXXXVII.

With the courſe and diſtance conſtruct the triangle ABC (fig. 25.) and make DC equal to 448 the given difference of longitude. Now the middle latitude BCD will meaſure 48° 58′, and the difference of latitude AB 324 miles; hence the latitude left is 51° 40′, and that come to 46° 16′.

By Calculation.

To find the difference of latitude.

As radius -	-	-	10.00000
is to the coſine of the courſe	3¾ pts.	-	9.86979
ſo is the diſtance -	438	-	2.64147
to the difference of latitude	324.05	-	2.51126

To find the middle latitude.

As the difference of longitude	448	-	2.65128
is to the diſtance -	438	-	2.64147
ſo is the ſine of the courſe	3¾ pts.		9.82708
to the coſine of the middle latitude -	48° 58′		9.81727
half difference of latitude	2 42		
Latitude ſailed from -	51 40		
Latitude come to -	46 16		

Middle Latitude Sailing.

By Inſpection.

To the courſe 3¾ points, and half the diſtance 219 miles, the departure is 147.0, and difference of latitude 162.2; which doubled is 324.4. Again, to half the difference of longitude 224 in a diſtance column, the difference of latitude is 149.9 above 48°, and 146,9 over 49°.

Now, as 30 : 29 : : 60′ : 58

Hence the middle latitude is 48° 58′ : the latitude ſailed from is therefore 51°.40′, and latitude come to 46° 16′.

By Gunter's Scale.

The extent from 8 points to 4¼ points, the complement of the courſe on ſine rhumbs, will reach from the diſtance 438 miles to the difference of latitude 3245 on numbers. And the extent from the difference of longitude 448, to the diſtance 438 on numbers, will reach from the courſe 42° 11′ to the complement of the middle latitude 41° 2′ on ſines. Hence the latitude left is 51° 40′, and that come to 46° 16′.

Prob. X. Given the courſe, difference of latitude, and difference of longitude; to find both latitudes and diſtance.

Example. From a port in ſouth latitude a ſhip ſailed SW½W, and has made 690 miles of difference of latitude, and 20° 28 of difference of longitude.—Required both latitudes and diſtance?

By Conſtruction.

Conſtruct the triangle ABC (fig. 26.) with the given courſe and difference of latitude, and make CD equal to 1228 the difference of longitude. Then AC applied to the ſcale will meaſure 1088 miles; and the middle latitude BCD will meaſure 46° 47′. Hence the latitude left is 41° 2, and the latitude come to 52° 32′.

By Calculation.

To find the diſtance.

As radius -	-	-	10.00000
is to the ſecant of the courſe	4½ pts.		10.19744
ſo is the difference of latitude	690	-	2.83885
to the diſtance -	1088	-	3.03649

To find the middle latitude.

As the difference of longitude	1228	-	3.08920
is to the diſtance -	1088	-	3.03649
ſo is the ſine of the courſe	4½ pts.		9.88819
to the coſine of the middle latitude -	46° 47′		9.83548
Half difference of latitude -	5 45		
Latitude ſailed from -	41 2		
Latitude come to -	52 32		

By Inſpection.

To the courſe 4½ points, and one-fourth of the given difference of latitude 172.5 the departure is 210.2

Fig. 1.

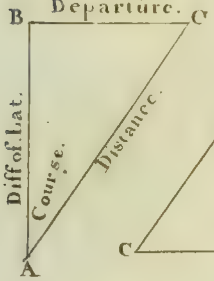


Fig. 2.

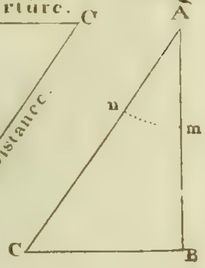


Fig. 3. Fig. 4.

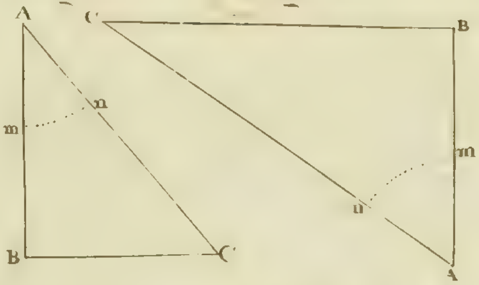


Fig. 5. Fig. 6.

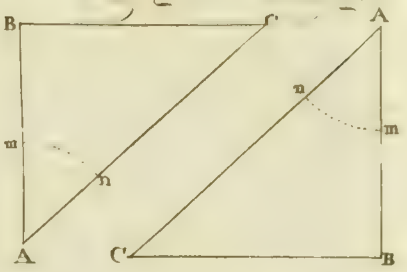


Fig. 7.

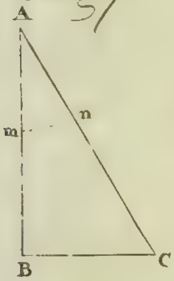
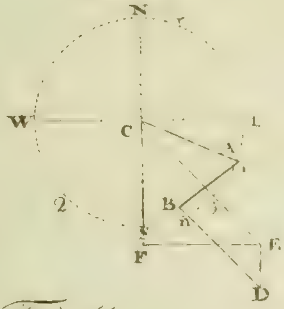


Fig. 8.



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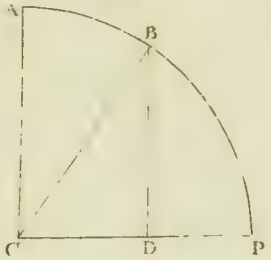
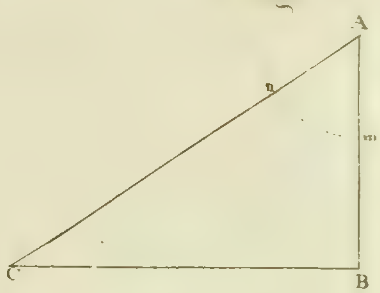


Fig. 10.



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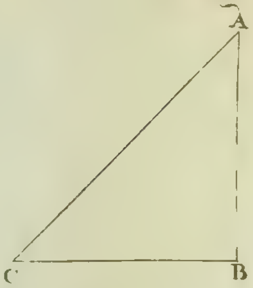

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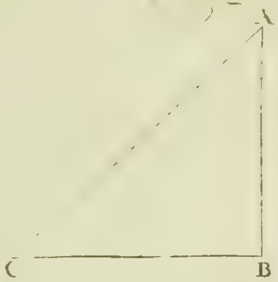


Fig. 13.

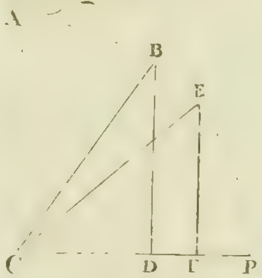
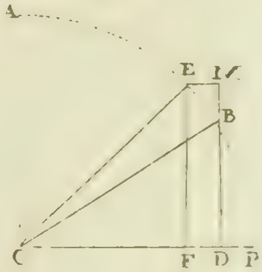


Fig. 14.



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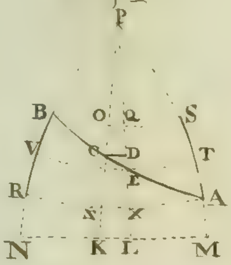

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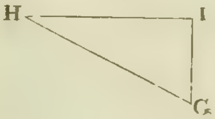

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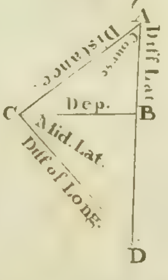

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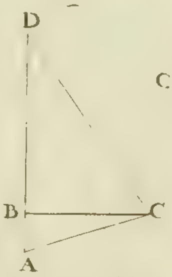

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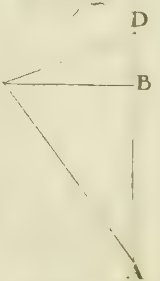

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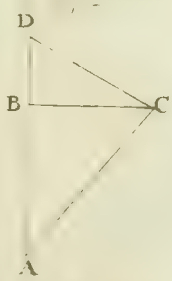


Fig. 21.

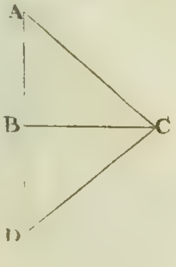


Fig. 22.

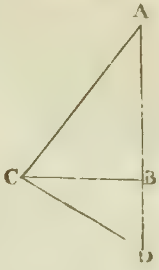


Fig. 23.

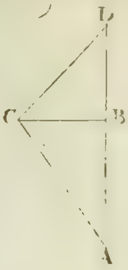


Fig. 24.

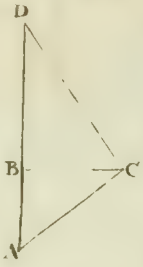


Fig. 25.

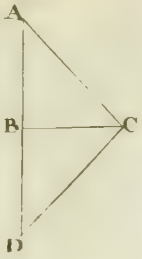


Fig. 26.

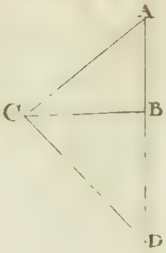
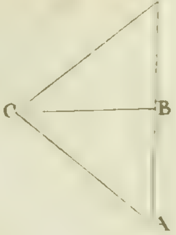


Fig. 27.



Middle Latitude Sailing.

210.2, and diſtance 272, which multiplied by 4 is 1088.

Now the middle latitude anſwering to the difference of longitude 1228, and the departure 840.8, or their aliquot parts, will be found as in laſt problem to be 46° 47′. Hence the latitudes are 41° 2′ and 52° 32′ reſpectively.

By Gunter's Scale.

The extent from the complement of the courſe 3½ points to 8 points on ſine rhumbs, will reach from the difference of latitude 690 to the diſtance 1088 miles on numbers; and the extent from the difference of longitude 1228 to the diſtance 1088 on numbers, will reach from the courſe 50° 38′ to the complement of the middle latitude 43° 13′ on the line of ſines.—Hence both latitudes are found as before.

Prob. XI. Given the diſtance ſailed, difference of latitude, and difference of longitude, to find both latitudes and courſe.

Example. In north latitude, a ſhip ſailed 458 miles on a direct courſe between the north and weſt; and then was found to have differed her latitude 296 miles, and longitude 7° 17′. Required both latitudes and courſe?

By Conſtruction.

Plate cccxxxvii.

With the diſtance and difference of latitude conſtruct the triangle ABC (fig. 27.) and make CD equal to the difference of longitude 437; then the courſe BAC will be found to meaſure 49° 44′, and the middle latitude BCD 36° 54′: Hence the latitude left is 34° 26′, and that come to 39° 22′.

By Calculation.

To find the courſe.

As the difference of latitude	296	-	2.47129
is to the diſtance -	458	-	2.66086
ſo is radius - -	-		10.00000
to the ſecant of the courſe	49° 44′		10.18957

To find the middle latitude.

As the difference of longitude	437	-	2.64048
is to the diſtance -	458	-	2.66086
ſo is the ſine of the courſe	49 44	-	9.88255
to the coſine of the middle latitude -	36 54	-	9.90293
Half difference of latitude	2 28		
Latitude left - -	34 26		
Latitude come to -	39 22		

By Inſpection.

To half the diſtance 229 the difference of latitude is 150.2 at 49°, and 147.2 at 50°.

Then, as 3.0 : 2.2 :: 60′ : 44′

Therefore the courſe is 49° 44′

Alſo the departure is 172.8 at 49°, and 175.4 at 50°,

Hence, as 3.0 : 2,2 :: 2.6 : 1.9

And 172.8 + 1.9 = 174.7 = half the departure

Now to half the difference of longitude 218.5 in a diſtance column, the difference of latitude is 176.8 at 36°, and 174.5 at 37°.

Then, as 2.3 : 2.1 :: 60′ : 54′.

Hence the middle latitude 36° 54′; and therefore the latitude failed from is 34° 26′, and that come to 39° 22′.

By Gunter's Scale.

The extent from the diſtance 458 to the difference of latitude 296 on numbers, will reach from 90° to 40° 16′ the complement of the courſe on ſines: and the extent from the difference of longitude 437 to the diſtance 458 on numbers, will reach from the courſe 49° 44′, to the complement of the middle latitude 53° 6′ on the line of ſines: Hence the latitudes are 34° 26′ and 39° 22′ reſpectively.

Prob. XII. Given the diſtance, middle latitude, and difference of longitude, to find both latitudes and courſe.

Example. The diſtance is 384 miles between the ſouth and eaſt, the middle latitude 54° 6, and difference of longitude 6° 36′. Required both latitude and courſe?

By Conſtruction.

Plate cccxxxviii.

With the middle latitude 54° 6′, and difference of longitude 396, conſtruct the triangle BCD (fig. 28.) and make AC equal to the given diſtance 384 miles. Then the courſe BAC will be found to meaſure 37° 12′, and the difference of latitude AB 306 miles.—Hence the latitude ſailed from is 56° 39′, and that come to 51° 33′.

By Calculation.

To find the courſe.

As the diſtance -	384	-	2,58433
is to the difference of longitude -	396	-	2.59769
ſo is the coſine of middle latitude -	54° 6′	-	9.76817
to the ſine of the courſe	37 12	-	9.78153

To find the difference of latitude.

As radius - -	-		10.00000
is to the coſine of the courſe	37° 12′	-	9.90120
ſo is the diſtance -	384	-	2.58433
to the difference of latitude	305.9	-	2.48553
Middle latitude -	54° 6′		
Half difference of latitude	2 33		
Latitude ſailed from -	56 39 N		
Latitude come to -	51 33 N		

By Inſpection.

To the middle latitude 54°, and half the difference of longitude 198 in a diſtance column, the number in a latitude column is 116.4. Now half the diſtance 192 and 116.4 in a departure column, are found to agree nearly under the courſe 37°, and the correſponding difference of latitude 153; which doubled is 306 miles. Hence the latitude left is 56° 39′ N, and latitude come to 51° 33′ N.

By Gunter's Scale.

The extent from the diſtance 384 to the difference of longitude 396 on the line of numbers, will reach from 35° 54′, the complement of the middle latitude, to 37° 12′, the courſe on the line of ſines: And the extent from 90° to 52° 48′ the complement of the courſe on ſines, will reach from the diſtance 384 to the difference of latitude 306 on numbers. Hence the latitudes are known.

Prob. XIII. To determine the difference of longitude made good upon compound courſes, by middle latitude ſailing.

Rule. I. With the ſeveral courſes and diſtances find the difference of latitude and departure made good, and the ſhip's preſent latitude, as in traverſe ſailing.

Now enter the traverſe table with the given middle latitude, and the departure in a latitude column, the correſponding diſtance will be the difference of longitude, of the ſame name with the departure.

Example. A ſhip from Cape Clear, in latitude 51° 18′ N, longitude 9° 46′ W, ſailed as follows:— SW*b*S 34 miles, W*b*N 63 miles, NNW 48 miles, and NE½E 85 miles. Required the latitude and longitude come to?

Courſes.	Diſt.	Diff. of Latitude.		Departure.	
		N	S	E	W
SW*b*S	54	—	44.9	—	30.0
W*b*N	63	12.3	—	—	61.8
NNW	48	44.4	—	—	18.4
NE½E	85	53.9	—	65.7	—
		110.6	44.9	65.7	110.2
		44.9	—	—	65.7
N 34° W	79	65.7=	1 6N		44.5

Latititude of Cape Clear 51 18N

Latitude come to - 52 24N
Sum - - 103 42
Middle latitude - 51 51

Now, to middle latitude 51° 51′ or 52°, and departure 44.5 in a latitude column, the difference of longitude is 72 in a diſtance column.

Longitude of Cape Clear - 9 46 W
Difference of longitude - 1 12 W

Longitude come to - 10° 58′ W

The above method is that always practiſed to find the difference of longitude made good in the courſe of a day's run; and will, no doubt, give the difference of longitude tolerably exact in any probable run a ſhip may make in that time, eſpecially near the equator. But in a high latitude, when the diſtances are conſiderable, this method is not to be depended on.—To illuſtrate this, let a ſhip be ſuppoſed to ſail from latitude 57° N, as follows: E 240 miles, N 240 miles, W 240 miles, and S 240 miles: then, by the above method, the ſhip will be come to the ſame place ſhe left. It will, however, appear evident from the following conſideration, that this is by no means the caſe; for let two ſhips, from latitude 61° N, and diſtant 240 miles, ſail directly ſouth till they are in latitude 57° N; now their diſtance being computed by Problem IV. of Parallel Sailing, will be 269.6 miles; and, therefore, if the ſhip ſailed as above, ſhe will be 29.6 miles weſt of the place ſailed from; and the error in longitude will be equal to 240 × ſecant 61—ſecant 57° = 29.6 × ſecant 57°.

Theorems might be inveſtigated for computing the errors to which the above method is liable. Theſe corrections may, however, be avoided, by uſing the following method.

Rule II. Complete the traverſe table as before, to which annex five columns: the firſt column is to contain the ſeveral latitudes the ſhip is in at the end of each courſe and diſtance; the ſecond, the ſums of each following pair of latitude; the third, half the ſums, or middle latitudes; and the fourth and fifth columns are to contain the differences of longitude.

Now find the difference of longitude anſwering to each middle latitude and its correſponding departure, and put them in the eaſt or weſt difference of longitude columns, according to the name of the departure. Then the difference of the ſums of the eaſt and weſt columns will be the difference of longitude made good, of the ſame name with the greater.

Ex. A ſhip from Halliford in Iceland, in lat. 64° 30′ N, long. 27° 15′ W, ſailed as follows: SSW 46 miles, SW 61 miles, S*b*W 59 miles, SE*b*E 86 miles, S*b*E½E 76 miles. Required the lat. and long. come to?

Traverse Table.

Courſes.	Diſt.	Diff. of Lat.		Departure.	
		N	S	E	W
SSW	46	—	42.5	—	17.6
SW	61	—	43.1	—	43.1
S*b*W	59	—	57.9	—	11.5
S*b*E	86	—	47.8	71.5	—
SE*b*½E	76	—	72.7	22.0	—
			264.0.	93.5	72.2
				72.2	
By Rule I.				21.3	

Latitude Halliford - - 64° 30′ N
Difference of latitude - 4 24 S
Latitude in - - 60 6 N
Sum - - - 124 36
Middle latitude - 62 18

Now, to middle lat. 62 18, and departure 21.3, the difference of long. is 46 E.

Longitude Halliford - 27 15 W
Longitude in - - 16 29

The Error of comm. method, in this Ex. is 12′.

Longitude Table.

Succeſſive Latitudes.	Sums.	Middle Latitude.	Diff of Longitude.	
			E	W
64° 30′	—	—	—	—
63 48	128° 18′	64° 9′	—	40.4
63 5	126 53	63 27	—	96.4
62 7	125 12	62 36	—	25.0
61 19	123 26	61 43	150.9	—
60 6	121 25	60 43	45.0	—
			195.9	161.8
			161.8	

Difference of longitude - 34.1
Longitude Halliford - 27.15 W
Longitude in - - 26,41 W

Chap. VI. *Of Mercator's Sailing.*

It was obſerved in Middle Latitude Sailing, that the difference of longitude made upon an oblique rhumb could not be exactly determined by uſing the middle latitude. In Mercator's ſailing, the difference of longitude is very eaſily found, and the ſeveral problems of ſailing reſolved with the utmoſt accuracy, by the aſſiſtance of Mercator's chart or equivalent tables.

In Mercator's chart the meridians are ſtraight lines parallel to each other; and the degrees of latitude, which at the equator are equal to thoſe of longitude, encreaſe with the diſtance of the parallel from the equator. The parts of the meridian thus encreaſed are called *meridional parts*. A table of theſe parts was firſt conſtructed by Mr Edward Wright, by the continual addition of the ſecants of each minute of latitude.

For by parallel ſailing,

R : coſ. of lat. : : part of equat. : ſimilar part of parallel.

And becauſe the equator and meridian on the globe are equal, therefore,

R : coſ. lat. : : part of meridian : ſimilar part of parallel.

Or ſec. lat. : R : : part of merid. : ſimilar part of parallel.

Hence, $\frac{\text{ſecant latitude}}{\text{part of meridian,}} = \frac{\text{R}}{\text{part of parallel.}}$

But in Mercator's chart the parallels of latitude are equal, and radius is a conſtant quantity. If therefore the latitude be aſſumed ſucceſſively equal to 1′, 2′, 3′, &c. and the correſponding parts of the enlarged meridian be repreſented by *a*, *b*, *c*, &c.; then,

$\frac{\text{ſecant } 1'}{\text{part of mer. } a} = \frac{\text{ſecant } 2'}{\text{part of mer. } b} = \frac{\text{ſecant } 3'}{\text{part of mer. } c.}$ &c.

Hence ſecant 1′ : part of mer. *a* : : ſecant 2′ : part of mer. *b* : : ſecant 3′ : part of mer. *c*, &c.

Therefore by 12th V. Euclid,

Secant 1′ : part of mer. *a* : : ſecant 1′ + ſecant 2′ + ſecant 3′, &c. : parts of mer. $a+b+c$, &c.

That is, the meridional parts of any given latitude is equal to the ſum of the ſecants of the minutes in that latitude (D).

Since CD : LK : : R : ſecant LD, fig. 15.

And in the triangle CED,

ED : CD : : R : tangent CED;

Therefore, ED : LK . : R^2 : ſecant LD × tangent CED

Hence $\text{LK} = \frac{\text{ED} \times \text{ſec. LD} \times \text{tang. CED}}{R^2} = \frac{\text{ED} \times \text{ſec. LD}}{R} \times \frac{\text{tang CED.}}{R}$

But $\frac{\text{ED} \times \text{ſec. LD}}{R}$ is the enlarged portion of the meridian anſwering to ED. Now the ſum of all the quantities $\frac{\text{ED} \times \text{ſecant LD}}{R}$ correſponding to the ſum of all the ED's contained in AS will be the meridional parts anſwering to the difference of latitude AS; and MN is the ſum of all the correſponding portions of the equator LK.

Whence MN = mer. diff. of lat. × tangent $\frac{\text{CED}}{\text{R.}}$

That is, the difference of longitude is equal to the meridional difference of latitude multiplied by the tangent of the courſe, and divided by the radius.

This equation anſwers to a right-angled rectilineal triangle, having an angle equal to the courſe; the adjacent ſide equal to the meridional difference of latitude, and the oppoſite ſide the difference of longitude. This triangle is therefore ſimilar to a triangle conſtructed, with the courſe and difference of latitude, according to the principles of plane ſailing, and the homologous ſides will be proportional. Hence if, in fig. 29. the angle A repreſents the courſe AB the difference of latitude, and if AD be made equal to the meridional difference of latitude; then DE, drawn perpendicular to AD, meeting the diſtance produced to E, will be the difference of longitude.

Plate CCCXXXVIII.

It is ſcarce neceſſary to obſerve, that the meridional difference of latitude is found by the ſame rules as the proper difference of latitude; that is, if the given latitudes be of the ſame name, the difference of the correſponding meridional parts will be the meridional difference of latitude; but if the latitudes are of a contrary denomination, the ſum of theſe parts will be the meridional difference of latitude.

Prob. I. Given the latitudes and longitudes of two places, to find the courſe and diſtance between them.

Example. Required the courſe and diſtance between Cape Finiſterre, in latitude 42° 52′ N, longitude 9° 17′ W, and Port Praya in the iſland of St Jago, in latitude 14° 54′ N, and longitude 23° 29′ W?

Lat. Cape Finiſterre	42° 52′	Mer. parts	2852
Latitude Port Praya	14 54	Mer. parts	904
Difference of lat. =	27 58	Mer. diff. lat.	1948
	1678		

Longitude Cape Finiſterre	-	9° 17′ W
Longitude Port Praya	-	23 29 W
Diff. longitude	-	14 12 = 852.

By Conſtruction.

Draw the ſtraight line AD (fig. 29.) to repreſent the meridian of Cape Finiſterre, upon which lay off AB, AD equal to 1678 and 1948, the proper and meridional differences of latitude; from D draw DE perpendicular to AD, and equal to the difference of longitude 852 join AE, and draw BC parallel to DE; then the diſtance AC will meaſure 1831 miles, and the courſe BAC 23° 37′.

By Calculation.

To find the courſe.

As the meridian difference of lat.	1948	3.28959
is to the difference of longitude	852	2.93044
ſo is radius - - -		10.00000
to the tangent of the courſe	23° 37′	9.64085

To find the diſtance.

As radius - - -		10.00000
is to the ſecant of the courſe,	23° 37′	10.03798
ſo is the difference of latitude	1678	3.22479
to the diſtance -	1831	3.26277

By

(D) This is not ſtrictly true; for inſtead of taking the ſum of the ſecants of every minute in the diſtance of the given parallel from the equator, the ſum of the ſecants of every point of latitude ſhould be taken.

By Inſpection.

As the meridian difference of latitude and difference of longitude are too large to be found in the tables, let the tenth of each be taken; theſe are 194.8 and 85.2 reſpectively. Now theſe are found to agree neareſt under 24°; and to 167.8, one-tenth of the proper difference of latitude, the diſtance is about 183 miles, which multiplied by 10 is 1830 miles.

By Gunter's Scale.

The extent 1948, the meridional difference of latitude, to 852, the difference of longitude on the line of numbers, will reach from 45° to 23° 37′, the courſe on the line of tangents. And the extent from 66° 23′, the complement of the courſe to 90° on ſines, will reach from 1678, the proper difference of latitude, to 1831, the diſtance on the line of numbers.

Prob. II. Given the courſe and diſtance ſailed from a place whoſe ſituation is known, to find the latitude and longitude of the place come to.

Example. A ſhip from Cape Hinlopen in Virginia, in latitude 38° 47′ N, longitude 75° 4′ W, ſailed 267 miles NE*b*N. Required the ſhip's preſent place?

By Conſtruction.

Plate cccxxxviii

With the courſe and diſtance ſailed conſtruct the triangle ABC (fig. 30.); and the difference of latitude AB being meaſured, is 222 miles: hence the latitude come to is 42° 29′ N, and the meridional difference of latitude 293. Make AD equal to 293; and draw DE perpendicular to AD, and meeting AC produced in E: then the difference of longitude DE being applied to the ſcale of equal parts will meaſure 196; the longitude come to is therefore 71° 48′ W.

By *Calculation.*

To find the difference of latitude.

As radius - - -		10.00000
is to the coſine of the courſe,	3 points	9.91985
ſo is the diſtance -	267	2.42651
to the difference of latitude	222	2.34636

Lat. Cape Hinlopen =	38° 47′ N.	Mer. parts 2528
Difference of lat.	3 42 N.	
Latitude come to	42 29 N.	Mer. parts 2821
	Meridional difference of lat.	293

To find the difference of longitude.

As radius - -		10.00000
is to the tangent of the courſe,	3 points	9.82489
ſo is the mer. diff. of latitude	293	2.46687
to the difference of longitude	195.8	2.29176

Longitude Cape Hinlopen	75° 4′ W
Difference of longitude -	3 16 E
Longitude come to -	71 48 W

By *Inſpection.*

To the courſe 3 points, and diſtance 267 miles, the difference of latitude is 222 miles: hence the latitude in, is 42° 29′, and the meridional difference of latitude 293. Again, to courſe 3 points, and 146.5 half the mer. difference of latitude, the departure is 97.9, which doubled is 195.8, the difference of longitude.

By Gunter's Scale.

The extent from 8 points to the complement of the courſe 5 points on ſine rhumbs, will reach from the diſtance 267 to the difference of latitude 222 on numbers; and the extent from 4 points to 3 points on tangent rhumbs, will reach from the meridional difference of latitude 293 to the difference of longitude 196 on numbers.

Prob. III. Given the latitudes and bearing of two places, to find their diſtance and difference of longitude.

Example. A ſhip from Port Canſo in Nova Scotia, in latitude 45° 20′ N, longitude 60° 55′ W, ſailed SE ¼S, by obſervation is found to be in latitude 41° 14′ N. Required the diſtance ſailed, and longitude come to?

Lat. Port Canſo -	45° 20′ N	Mer. parts	3058
Lat. in by obſervation	41 14 N	Mer. parts	2720
Difference of lat. -	4 6	Mer. diff. lat.	338
	246		

By *Conſtruction.*

Make AB (fig. 31.) equal to 246, and AD equal to 338; draw AE, making an angle with AD equal to 3¾ points, and draw BC, DE perpendicular to AD. Now AC being applied to the ſcale, will meaſure 332, and DE 306.

By Calculation.

To find the diſtance.

As radius - -		10.00000
is to the ſecant of the courſe,	3¾ points	10.13021
ſo is the difference of latitude	246	2.39093
to the diſtance -	332	2.52114

To find the difference of longitude.

As radius - -		10.00000
is to the tangent of the courſe,	3¾ points	9.95729
ſo is the mer. diff. of latitude	338	2.52892
to the difference of longitude	306.3	2.48621

Longitude Port Canſo -	60° 55′ W
Difference of longitude -	5 6 E
Longitude in - -	55 49 W

By Inſpection.

Under the courſe 3¾ points, and oppoſite to half the difference of latitude, 123 in a latitude column is 166 in a diſtance column, which doubled is 332 the diſtance; and oppoſite to 169, half the meridional difference of latitude in a latitude column, is 153 in a departure column, which doubled is 306, the difference of longitude.

By Gunter's Scale.

The extent from the complement of the courſe 4¼ points to 8 points on ſine rhumbs, will reach from the difference of latitude 246 m. to the diſtance 332 on numbers; and the extent from 4 points, to the courſe 3¾ points on tangent rhumbs, will reach from the meridional difference of latitude 338 to the difference of longitude 306 on numbers.

Prob. IV. Given the latitude and longitude of the place ſailed from, the courſe, and departure; to find the diſtance, and the latitude and longitude of the place come to.

Example. A ſhip ſailed from Sallee in Latitude 33° 58′ N, longitude 6° 20′ W, the corrected courſe was NW*b*W¼W, and departure 420 miles. Required the diſtance run, and the latitude and longitude come to?

By Conſtruction.

With the courſe and departure conſtruct the triangle ABC (fig. 32.): now AC and AB being meaſured, will be found equal to 476 and 224 reſpectively: hence the latitude come to is 37° 42′ N, and meridional difference of latitude 276. Make AD equal to 276; and draw DE perpendicular thereto, meeting the diſtance produced in E; then DE applied to the ſcale will be found to meaſure 516′. The longitude in therefore is 14° 56′ W.

Plate cccxxxviii

By Calculation.

To find the diſtance.

As radius	- - -		10.00000
is to to the coſecant of the courſe,		5½ pts	10.05457
ſo is the departure	- -	420	2.62325
to the diſtance	- -	576.2	2.67782

To find the difference of latitude.

As radius	- -		10.00000
is to the co-tangent of the courſe,		5½ pts	9.72796
ſo is the departure	-	420	2.62325
to the difference of latitude	-	224.5	2.35121

Lat. of Sallee	33° 58′ N	Mer. parts 2169
Diff. of lat.	3 44 N	
Latitude in	37 42 N	Mer. parts 2445
Mer. difference of latitude		276

To find the difference of longitude.

As radius	- - -	10.00000
is to the tangent of the courſe	5½ pts	10.27204
ſo is the mer. diff. of latitude	276	2.44091
to the difference of longitude	516.3	2.71295

Longitude of Sallee	-	6° 20′ W
Difference of longitude	-	8 36 W
Longitude in	- -	14 56 W

By Inſpection.

Above 5½ points the courſe, and oppoſite to 210 half the departure, are 238 and 112; which doubled, we have 476 and 224, the diſtance and difference of latitude reſpectively. And to the ſame courſe, and oppoſite to 138, half the meridional difference of latitude, in a latitude column, is 258 in a departure column; which being doubled is 516, the difference of longitude.

By Gunter's Scale.

The extent from 5½ points, the courſe on ſine rhumbs, to the departure 420 on numbers, will reach from 8 points on ſine rhumbs to the diſtance 476 on numbers; and from the complement of the courſe 2½ points on ſine rhumbs to the difference of latitude 224 on numbers.

Again, the extent from difference of latitude 224 to the meridional difference of latitude 276 on numbers, will reach from the departure 420 to the difference of longitude 516 on the ſame line.

Prob. V. Given the latitudes of two places, and their diſtance, to find the courſe and difference of longitude.

Example. A ſhip from St Mary's, in latitude 36° 57′ N, longitude 25° 9′ W, ſailed on a direct courſe between the north and eaſt 1162 miles, and is then by obſervation in latitude 49° 57′ N. Required the courſe and longitude come to?

Lat. of St Mary's	-	36° 57′ N	Mer. parts 3470
Lat. come to	-	49 57 N	Mer. parts 2389
Difference of lat.		13 0	Mer. diff. lat. 1081
		780	

By Conſtruction.

Make AB (fig. 33.) equal to 780, and AD equal to 1081; draw BC, DE perpendicular to AD; make AC equal to 1162 m. and through AC draw ACE. Then the courſe or angle A being meaſured, will be found equal to 47° 50′, and the difference of longitude DE will be 1194.

By Calculation.

To find the courſe.

As the diſtance	- -	1162	3.06521
is to the difference of latitude,		780	2.89209
ſo is radius	- - -		10.00000
to the coſine of the courſe	-	47° 50′	9.82688

To find the difference of longitude.

As radius	- - -		10 00000
is to the tangent of the courſe,		47° 50′	10.04302
ſo is the mer. diff. of latitude		1081	3.03383
to the difference of longitude		1194	3.07685

Longitude of St Mary's	-	25° 9′ W
Difference of longitude	-	19 54 E
Longitude in	-	5 15 W

By Inſpection.

Becauſe the diſtance and difference of latitude exceed the limits of the table, take the tenth of each; theſe are 116.2 and 78.0: Now theſe are found to agree neareſt above 4½ points, which is therefore the courſe; and to this courſe, and oppoſite to 108.1, one tenth of the meridional difference of latitude, in a latitude column, is 119.3 in a departure column, which multiplied by 10 is 1193, the difference of longitude.

By Gunter's Scale.

The extent from the diſtance 1162 m. to the difference of latitude 780 m. on numbers, will reach from 90° to 42° 10′ in the line of ſines. And the extent 45°, to the courſe 47° 50′ on the line of tangents, will reach from the meridional difference of latitude 1081 to the difference of longitude 1194 on numbers.

Prob. VI. Given the latitudes of two places, and the departure; to find the courſe, diſtance, and difference of longitude.

Example. From Aberdeen, in latitude 57° 9′ N, longitude 2° 9′ W. a ſhip ſailed between the ſouth and eaſt till her departure is 146 miles, and latitude come to 53° 32′ N. Required the courſe and diſtance run, and longitude come to?

Latitude Aberdeen	57° 9′ N.	mer. parts 4199
Latitude come to	53 32 N.	mer. parts 3817
Difference of latitude	3 37	mer. diff. of lat. 382
	217.	

Plate CCCXXXVIII.

By Conſtruction.

With the difference of latitude 217m. and departure 146m. conſtruct the triangle ABC (fig. 34.), make AD equal to 382, draw DE parallel to BC, and produce AC to E: Then the courſe BAC will meaſure 33° 56, the diſtance AC 261, and the difference of longitude DE 257.

By Calculation.

To find the courſe.

As the difference of latitude	217	2.33646
is to the departure	146	2.16435
ſo is radius - - -		10.00000
to the tangent of the courſe	33° 56′	9.82789

To find the diſtance.

As radius - - -		10.00000
is to the ſecant of the courſe	33° 56′	10.08109
ſo is the difference of latitude	217	2.33646
to the diſtance	261.5	2.41755

To find the difference of longitude.

As the difference of latitude	217	2.33646
is to the mer. diff. of latitude	382	2.58206
ſo is the departure	146	2.16435
to the difference of longitude	257	2.40995
Longitude of Aberdeen		2° 9′ W
Difference of longitude		4 17 E
Longitude come to - -		2 8 E

By Inſpection

The difference of latitude 217, and departure 146, are found to agree neareſt under 34°, and the correſponding diſtance is 262 miles. To the ſame courſe, and oppoſite to 190.7, the neareſt to 191 half the meridional difference of latitude, is 128.6 in a departure column, which doubled is 257, the difference of longitude.

By Gunter's Scale.

The extent from the difference of latitude 217, to the departure 146 on numbers, will reach from 45° to about 34°, the courſe on the line of tangents; and the ſame extent will reach from the meridional difference of latitude 382 to 257, the difference of longitude on numbers.—Again, the extent from the courſe 34° to 90 on ſines, will reach from the departure 146 to the diſtance 261 on numbers.

Prob. VII. Given one latitude, diſtance, and departure; to find the other latitude, courſe, and difference of longitude.

Example. A ſhip from Naples, in latitude 40° 51′ N, longitude 14° 14′ E, ſailed 252 miles on a direct courſe between the ſouth and weſt, and made 173 miles of weſting. Required the courſe made good, and the latitude and longitude come to?

By Conſtruction.

With the diſtance and departure make the triangle ABC (fig. 35.) as formerly.—Now the courſe BAC being meaſured by means of a line of chords will be found equal to 43° 21′, and the difference of latitude applied to the ſcale of equal parts will meaſure 183′: hence the latitude come to is 37° 48′ N, and meridional difference of latitude 237.—Make AD equal to 237, and complete the figure, and the difference of longitude will meaſure 224′: hence the longitude in is 10° 30′ E.

By Calculation.

To find the courſe.

As the diſtance	252	2.40140
is to the departure	173	2.23805
ſo is radius - - -		10.00000
to the ſine of the courſe	43° 21′	9.83665

To find the difference of latitude.

As radius - - -		10.00000
is to the coſine of the courſe	43° 21′	9.86164
ſo is the diſtance	252	2.40140
to the difference of latitude	183.2	2.26304
Latitude of Naples	40° 51′ N. Mer. parts	2690
Difference of latitude	3 3 S	
Latitude come to	37 48 N. Mer. parts	2453
Meridional difference of latitude		237

To find the difference of longitude.

As radius - - -		10.00000
is to the tangent of the courſe	43° 21′	9.97497
ſo is the mer. diff. of latitude	237	2.37475
to the difference of longitude	223.7	2.34972
Longitude of Naples		14° 14′ E
Difference of longitude		3 44 W
Longitude in - -		10 30 E.

By Inſpection.

Under 43° and oppoſite to the diſtance 252 m. the departure is 171.8, and under 44°, and oppoſite to the ſame diſtance, the departure is 175.0.

Then as 3.2 : 1.2 :: 60′ : 22′

Hence the courſe is 43° 22′

Again, under 43° and oppoſite to 118.5, half the meridional difference of latitude in a latitude column, is 110.5 in a departure column; alſo under 44° and oppoſite to 118.5 is 114.4.

Then as 3.2 : 1.2 :: 3.9 : 1.5

And 110.5 + 1.5 = 112, which doubled is 224, the difference of longitude.

By Gunter's Scale.

The extent from the diſtance 252 on numbers to 90° on ſines will reach from the departure 173 on numbers to the courſe 43°⅓ on ſines; and the ſame extent that will reach from the complement of the courſe 46°⅔ on ſines will reach to the difference of latitude on numbers.—Again, the extent from 45° to 43°⅓ on tangents will reach from the meridional difference of latitude 237 to the difference of longitude 224 on numbers.

Prob. VIII. Given one latitude, courſe and difference of longitude; to find the other latitude and diſtance.

Example. A ſhip from Tercera, in latitude 38° 45′ N, longitude 27° 6′ W, ſailed on a direct courſe, which, when corrected, was N 32° E, and is found by obſervation to be in longitude 18° 24′ W. Required the latitude come to, and diſtance ſailed?

Longitude of Tercera		27° 6′ W
Longitude in		18 24 W
Difference of longitude	-	8 42 = 522

By

By Conſtruction.

Plate cccxxxviii.

Make the right angled triangle ADE (fig. 36.) having the angle A equal to the courſe 32°, and the ſide DE equal to the difference of longitude 522: then AD will meaſure 835, which added to the meridional parts of the latitude left, will give theſe of the latitude come to 48° 46′; hence the difference of latitude is 601: make AB equal thereto, to which let BC be drawn perpendicular; then AC applied to the ſcale will meaſure 708 miles.

By Calculation.

To find the meridional difference of latitude.

As radius, - -		10.00000
is to the co-tangent of the courſe	32° 0′	10.20421
ſo is the difference of longitude	5 22	2.71767
to the mer. difference of latitude	8352	2.92188

Latitude of Tercera 38° 45′ N Mer. parts 2526
Mer. diff. of lat. 835

Latitude come to 48 46 N. Mer. parts. 3361

Difference of latitude 10 1 = 601 miles.

To find the diſtance.

As radius - - -		10.00000
is to the ſecant of the courſe	32° 0′	10.07158
ſo is the difference of latitude	601	2.77887
to the diſtance	707.7	2.85045

By Inſpection.

To courſe 32°, and oppoſite to 130.5, one fourth of the given difference of latitude in a departure column, the difference of latitude is 208.8, which multiplied by 4 is 835, the meridional difference of latitude; hence the latitude in is 48° 46′ N, and difference of latitude 601.

Again, to the ſame courſe, and oppoſite to 200, one third of the difference of latitude, the diſtance is 236, which multiplied by 3 gives 708 miles.

By Gunter's Scale.

The extent from the courſe 32° to 45° on tangents will reach from the difference of longitude 522 to the meridional difference of latitude 835 on numbers.—And the extent from the complement of the courſe 58° to 90° on ſines, will reach from the difference of latitude 601 to the diſtance 708 miles on numbers.

Prob. IX. To find the difference of longitude made good upon compound courſes.

Rule. With the ſeveral courſes and diſtances, complete the Traverſe Table, and find the difference of latitude, departure, and courſe made good, and the latitude come to as in Traverſe Sailing. Find alſo the meridional difference of latitude.

Now, to the courſe and meridional difference of latitude in a latitude column, the correſponding departure will be the difference of longitude, which applied to the longitude left will give the ſhip's preſent longitude.

Example. A ſhip from Port St Julian, in latitude 49° 10′ S, longitude 68° 44′ W, ſailed as follows, ESE 53 miles, SE*b*S 74 miles, E by N 68 m. SE*b*E½E 47 miles, and E 84 miles. Required the ſhip's preſent place?

Courſes.	Diſt.	Diff. of Lat		Departure.	
		N	S	E	W
ESE	53		20.3	49.0	
SE*by*S	74		61.5	41.1	
E*by*N	68	13.3		66.7	
SE*by*E½E	47		22.1	41.5	
E	84			84.0	
		13.3	103.9 13.3	282.3	
S 72° E	297		90.6 = 1° 31′		

Latitude left. 49 10 S m. pt. 3397

Latitude come to 50 41 S m. pt. 3539

Mer. difference of latitude 142

Now to courſe 72°, and oppoſite to 71, half the mer. difference of latitude in a latitude column, is 218.7 in a departure column, which doubled is 437, the difference of longitude.

Longitude of Port St Julian	68° 44′ W
Difference of longitude	7 17 E
Longitude come to	61 27 W

Although the above method is that uſually employed at ſea to find the difference of longitude, yet as it has been already obſerved, it is not to be depended on, eſpecially in high latitudes; in which caſe the following method becomes neceſſary.

Rule II. Complete the Traverſe Table as before, to which annex five columns. Now with the latitude left, and the ſeveral differences of latitude, find the ſucceſſive latitudes, which are to be placed in the firſt of the annexed columns; in the ſecond the meridional parts correſponding to each latitude is to be put; and in the third, the meridional differences of latitude.

Then to each courſe, and correſponding meridional difference of latitude, find the difference of longitude, which place in the fourth or fifth columns, according as the courſe is eaſterly or weſterly; and the difference between the ſums of theſe columns will be the difference of longitude made good upon the whole of the ſame name with the greater.

Remarks.

1. When the courſe is north or ſouth, there is no difference of longitude.

2. When the courſe is eaſt or weſt, the difference of longitude cannot be found by Mercator's Sailing; in this caſe the following rule is to be uſed.

To the neareſt degree to the given latitude taken as a courſe, find the diſtance anſwering to the departure in a latitude column: this diſtance will be the difference of longitude.

Example I. Four days ago we took our departure from Faro-head, in latitude 58° 40′ N. and longitude 4° 50′ W, and ſince have ſailed as follows: NW 22 miles, W 69 miles, WNW 93 miles, W*b*S 77 miles, SW 58 miles, and W¾S 49 miles—Required our preſent latitude and longitude?

Traverſe Table.

Courſes.	Diſt.	Diff. of Lat		Departure.	
		N	S	E	W
NW	32	22.6			22.6
W	69				69.0
WNW	93	35.6			85.9
W*b*S	77		15.0		75.5
SW	58		41.0		41 0
W¼S	49		7.2		48.5
		58.2	63.2		342.5
			58.2		
W 1° S	343		5.0		

Longitude Table.

Succeſſive Latitudes.	Merid. Parts.	Merid. Diff. Lat.	Diff. of Longitude.	
			E	W
58° 40′	4370			
59 3	4415	45		45.0
59 3	4415	0		134.0
59 38	4484	69		166.5
59 23	4454	30		151.0
58 42	4374	80		80.0
58 35	4361	13		88.0
				664.5

Longitude of Faro-head - 4° 50′W.
Difference of longitude - 11 4 W.
Longitude in - - 15 54 W.

Example II. A ſhip from latitude 78° 15′ N, longitude 28° 84′ E. failed the following courſes and diſtances. The latitude come to is required, and the longitude, by both methods: the bearing and diſtance of Hacluit's head-land, in latitude 79° 55′ N. longitude 11° 55′ E. is alſo required?

Traverſe Table.

Courſes.	Diſt.	Diff. of Latitude.		Departure.	
		N	S	E	W
WNW	154	58.9	—	—	142.3
SW	96	—	67.9	—	67.9
NW½W	89	56.4	—	—	68.8
N*b*E	110	107.9	—	21.5	—
NW¾N	56	45.0	—	—	33.4
S*b*E¾E	78	—	73.4	26.3	—
		268.2	141.3	47.8	312.4
		141.3			47.8
		126.9			264.6

By Rule 1ſt.

Latitude left 78° 15′ N. Mer. pts = 7817
Diff. of latitude 2 7 N.

Lat. come to 80 22 N. Mer. pts = 8504

Meridional diff. of latitude - 687
As difference of lat. 126.9 2.10346
is to mer. diff. of latit. 687 - 2.83696
ſo is the departure 264.6 - 2.42256

to difference of longit. 1432 - 3.15606

23° 52′ W.
Longitude left 28 14 E.

Longitude in 4 22 E.

The error of this method in the preſent example, is therefore 1° 23′.

Longitude Table.

Succeſſive Latitudes.	Merid. Parts.	Merid. Diff. Lat.	Diff. of Longitude.	
			E	W
78° 15′	7817		—	
79 14	8120	303	—	731.7
78 6	7774	346	—	346.0
79 2	8056	282	—	343.6
80 50	8676	620	123.6	—
81 35	8970	294	—	218.0
80 22	8504	466	166.7	—
			290.3	1639.3
				290.3
				1349.0

Longitude left - - 28° 14′ E.
Difference of longitude - 22 29 W.

Longitude in - - 5 45 E.

To find the bearing and diſtance of Hacluit's head-land.

Lat. H H. = 79° 55′ N. M. P. 8347 Lon. 11° 55′E.
Lat. ſhip = 80 22 N. M. P. 8504 Lon. 5 45 E.

Diff. lat. 0 27 M. D. L. 157 D. L. 6 10

370

Now to 78.5 half the meridional difference of latitude, and 185.0 half the difference of longitude, the courſe 67°, and oppoſite to the difference of latitude 27, the diſtance is 69 miles.—Hence Hacluit's head-land bears S 67° E. diſtant 69 miles.

Method of resolving the Problems of Mercator's Sailing.

Chap. VII. *Containing the Method of reſolving the ſeveral Problems of Mercator's Sailing, by the Aſſiſtance of a Table of Logarithmic Tangents.*

Prob. The conſtant quantity 12.633114 (g) is to the difference or ſum of the logarithmic tangents of half the co-latitudes of two places, according as theſe latitudes are of the ſame, or a contrary denomination; as the tantgent of the courſe is to the difference of longitude.

Demonſt. Let CABP, Plate CCCXXXVIII. fig. 37. be a ſection of one fourth of the earth in the plane of the meridian; and let AC be the radius of the equator, and B any given place whoſe latitude is therefore AB. Draw BD perpendicular to AC, and BE parallel to it; and let B*b* be a very ſmall portion of the meridian, as one minute.——Now put CA $= r$, DB $= y$, BE $= x$, and $z =$ meridional parts anſwering to the arch AB.

Method of reſolving the Problems of Mercator's Sailing.

Then, $x : r :: bn : \frac{r}{x} \times bn$

but, $x : r :: \frac{r}{x} \times bn : \frac{r^2}{x^2} \times bn =$ correſpondent portion of the enlarged meridian. Now theſe being put into fluxions, we have,

$$\dot{z} = \frac{r^2}{x^2} \times \dot{} = \frac{\dot{y}}{r^2 - y^2}$$

Of which the fluent is,

$$z = \frac{2.302585 \times r}{2} \times \log. \frac{r+y}{r-y}$$

$$= 2.302585 \times r \times \log. \sqrt{\frac{r+y}{r-y}}$$

Now as the meridional parts are expreſſed in parts of the equator, this equation becomes,

$$z = \frac{2.302585 \times 180^\circ \times 60'}{3.15149} \times \log. \sqrt{\frac{r+y}{r-y}} = \frac{1}{.0001263314} \times \log. \sqrt{\frac{r+y}{r-y}},$$

$$\text{But } \log. \sqrt{\frac{r+y}{r-y}} = \log. \sqrt{\frac{r + \text{ſine AB}}{r - \text{ſine AB}}} = \log. \sqrt{\frac{\tan.\ (45+\frac{1}{2}\text{AB})}{\tan.\ (45-\frac{1}{2}\text{AB})}}$$

$$\text{And the tang. } (45-\tfrac{1}{2}\text{AB}) = \frac{1}{\tan.\ (45+\frac{1}{2}\text{AB})}$$

$$\text{Therefore } z = \frac{1}{.00012633114} \times \log. \sqrt{\tan.\ (45+\tfrac{1}{2}\text{AB})^2} =$$

$$= \frac{\text{log. tang. } (45+\frac{1}{2}\text{AB})}{.00012633114.} = \frac{\text{log. tang. half co-latitude.}}{.00012633114,\ \text{\&c.}}$$

Hence the meridional parts anſwering to any given latitude, is found by dividing the difference between the log. of the radius and the log. tangent of half the complement of latitude, by the conſtant quantity .00012633114, &c.; and the meridional difference of latitude is obtained by dividing the difference or ſum of the logarithmic tangents of half the co-latitudes, according as they are of the ſame or a contrary name, by the above quantity.

And the meridional difference of latitude multiplied by the tangent of the courſe, is equal to the difference of longitude. Hence the propoſition is manifeſt.

This method ſhall be illuſtrated with examples performed by calculation: the other methods of ſolution are purpoſely omitted.

Prob. I. Given the latitudes and longitudes of two places, to find the courſe and diſtance between them.

Example. Required the bearing and diſtance of Oſtend, in lat. 51° 14′ N.; long. 2° 56′ E. from Aberdeen, in latitude 57° 9′ N. and longitude 2° 9′ W.?

Long. Aberdeen,	2° 9′ W.	Lat. 57° 9′	comp. 32° 51′	half 16° 25½′	tangent 9.46951
Long. Oſtend,	2 56 E.	Lat. 51 14	comp. 38 46	half 19 23	tangent 9.54633
Diff. longitude	5 5=305	Diff. Lat. 5 55=355			Difference 7682

To find the courſe.

As the difference of the log. tang. 7682		3.88547
is to the conſtant logarithm	-	11.10151
ſo is the diff. of longitude	305	2.48430
to the tangent of the courſe	26° 38′	9.70034

To find the diſtance.

As radius - - -		10.00000
is to the ſecant of the courſe	26° 38′	10.04871
ſo is the difference of latitude	355	2.55023
to the diſtance -	397.1	2.59894

Prob. II. Given the latitudes and bearing of two places; to find the diſtance and differ. of longitude.

Example. Two days ago we were in latitude 23° 18′ S. longitude 16° 54′ W.; and having run upon a direct courſe, which corrected was S. 53° E. we were found to be in latitude 26° 26′ S. Required the diſtance ſailed, and longitude come to?

Lat. left,	23° 18′	comp. 66° 42′	half 33° 21′	tang. 9.81831
Lat. come to,	26 26	comp. 63 34	half 31 47	tang. 9.79213
Diff. of Lat.	3 8=188m.			Difference 2618

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g) In this caſe the tangent is to conſiſt of five figures beſides the index; but if the table extends to 6 or 7 figures, the above number will be 126.33, &c. or 1263.3, &c.

Method of reſolving the Problems of Mercator's Sailing.

To find the diſtance.

As radius - - -		10.00000
is to the ſecant of the courſe	53°	10.22054
ſo is the difference of latitude	188	2.27416
to the diſtance	312.4	2.49470

To find the difference of longitude.

As the conſtant logarithm -		11.10151
is to the tangent of the courſe	53°	10.12289
ſo is the diff. of log. tangents	2618	3.41797
to the difference of longitude	275	2.43935
Longitude left, - -		16° 54′ W.
Difference of longitude, -		4 35 E.
Longitude in - -		12 19 W.

Prob. III. Given the latitudes of two places, and the diſtance between them; to find the courſe and difference of longitude.

Example. A ſhip from latitude 48° 10′ N. longitude 15° 12′ W. ſailed on a direct courſe between the ſouth and weſt 284 miles, and is then in latitude 44° 52′ N. Required the courſe and longitude come to?

Lat. left, 48° 10′ N comp. 41° 50′ half 20° 55′ tang. 9.58229
Lat. in, 44 52 N. comp. 45 8 half 22 34 tang. 9.61865

Diff of lat. 3 18=198m. Difference 3636

To find the courſe.

As the diſtance -	284	2.45332
is to the difference of latitude	198	2.29666
ſo is radius - - -		10.00000
to the coſine of the courſe	45° 48′	9.84334

To find the difference of longitude.

As the conſtant logarithm -		11.10151
is to the tangent of the courſe	45° 48′	10.01213
ſo is the diff. of logarithm tangents	3636	3.36062
to the difference of longitude	186.7	2.27124
Longitude left, - -		15° 12′ W.
Difference of longitude - -		3 7 W.
Longitude come to - -		18 19 W.

Prob. IV. Given both latitudes and departure, to find the courſe, diſtance, and difference of longitude.

Example. A ſhip from latitude 18° 24′ S. longitude 3° 25′ E. ſailed between the north and weſt upon a direct courſe, till by obſervation ſhe is in latitude 12° 42′ N. and has made 970 miles of departure.—Required the courſe, diſtance, and longitude come to?

Lat. left, 18° 24′ S. comp 71° 36′ half 35° 48′ cotan. 0.14193
Lat. come to, 12 42 N. comp. 77 18 half 38 39 cotan. 0.09706

Diff. of lat. 31 6=1866 Sum 0.23899

To find the courſe.

As the difference of latitude	1866	3.27091
is to the departure -	970	2.98677
ſo is radius - - -		10.00000
to the tangent of the courſe,	27° 28′	9.71586

To find the diſtance.

As radius - -		10.00000
is to the ſecant of the courſe	27° 28′	10.05194
ſo is the difference of latitude	1866	3.27091
to the diſtance -	2103	3.32285

Method of reſolving the Problems of Mercator's Sailing.

To find the difference of longitude.

As the conſtant logarithm - -		11.10151
is to the tangent of the courſe	27° 28′	9.71586
ſo is the ſum of the log. tangents	23899	4.37838
to the difference of longitude	983.4	2.99273
Longitude left - -		3° 25′ E.
Difference of longitude -		16 23 W.
Longitude come to -		12 58 W.

Prob. V. Given one latitude courſe and diſtance; to find the other latitude and difference of longitude.

Example. From Scarborough, in latitude 54° 20′ N. longitude 0° 10′ W. ſhip ſailed NE ¾ E 210 miles. Required the latitude and longitude come to?

To find the difference of latitude.

As radius - - -		10.00000
is to the coſine of the courſe	4¾ points	9.77503
ſo is the diſtance -	210	2.32222
to the difference of latitude	125	2.09725

Lat. left, 54° 20′ N. comp. 35° 40′ half 17° 50′ tang. 9.50746
Diff. of lat. 2 5 N.

Lat. in, 56 25 N. comp. 33 35 half. 16 47½ tang. 9.47964

Difference 2782

To find the difference of longitude.

As the conſtant logarithm -		11.10151
is to the tangent of the courſe	4¾ pts.	10.12980
ſo is the difference of log. tang.	2782	3.44436
to the difference of longitude	296.9	2.47265
Longitude of Scarborough -		0 10 W.
Difference of longitude -		4 57 E.
Longitude come to, - -		4 47 E.

Prob. VI. Given one latitude, courſe, and departure, to find the other latitude, diſtance, and difference of longitude.

Example. A ſhip from latitude 32° 58′ N. longitude 16° 28′ W. ſailed SE½S, and made 164 miles of departure. Required the diſtance run, and latitude and longitude come to?

To find the diſtance.

As the ſine of the courſe	3½ pts.	9.80236
is to radius - -		10.00000
ſo is the departure -	164	2.21484
to the diſtance -	285.5	2.41248

To find the difference of latitude.

As the tangent of the courſe	3½ pts.	9.91417
is to radius - -		10.00000
ſo is the departure	164	2.21484
to the difference of latitude	199.8	2.30067

Lat left, - 32° 58′ N. comp. 57° 2′ half 28° 31′ tang. 9.73507
Diff. of lat. 3 20 S.

Lat. come to, 29 38 N. comp. 60 22 half 30 11 tang. 9.76464

Difference 2957

To find the difference of longitude.

As the conſtant logarithm -		11.10151
is to the tangent of the courſe	3½ pts.	9.91417
ſo is the difference of log. tangents	2957	3.47085
to the difference of longitude	192.1	2.28351

Longitude

Method of reſolving the Problems of Mercator's Sailing.

Longitude left,	- -	16° 28′W.
Difference of longitude,	-	3 12 E.
Longitude in,	- - -	13 16 W.

PROB. VII. Given one latitude, diſtance, and departure; to find the other latitude, courſe, and difference of longitude.

EXAMPLE. A ſhip from Cape Voltas, in latitude 28° 55′S. longitude 15° 53′E. ſailed 286 miles between the ſouth and weſt, and made 238 miles of departure. Required the courſe, the latitude and longitude come to?

To find the courſe.

As the diſtance -	286	2.45637
is to departure -	238	2.37658
ſo is radius - - -		10.00000
to the ſine of the courſe	56° 19′	9.92021

To find the difference of latitude.

As radius . - -		10.00000
is to the coſine of the courſe	56° 19′	9.74398
ſo is the diſtance -	286	2 45637
to the difference of latitude	158.6	2.20035

Lat. Cape Voltas, 28° 55′S. comp. 61° 5′ half 30° 32½′ tang. 9 77087
Diff. of Lat. 2 39 S.

Latitude in, 31 34 S, comp. 58 26 half 29 13 tang. 9 74762

Difference 2325

To find the difference of longitude.

As the conſtant logarithm	-	11.10151
is to the tangent of the courſe	56° 19′	10 17620
ſo is the diff. of log. tangents	2325	3.36642
to the difference of longitude	276.1	2.44111
Longitude Cape Voltas,	-	15° 53′E.
Difference of longitude,	-	4 36 W.
Longitude come to,	-	11 17 E.

PROB. VIII. Given one latitude, courſe, and difference of longitude, to find the other latitude and diſtance.

EXAMPLE. A ſhip from latitude 16° 54′N. longitude 62° 16′W. ſailed upon a NW. by N. courſe, until her longitude by obſervation is 68° 10′W. Required the diſtance run, and latitude come to?

Longitude left,	-	62° 16′W.
Longitude come to,	-	68 10 W.
Difference of longitude,	-	5 54=354

To find the latitude come to.

As the tangent of the courſe	3 pts.	9.82489
is to the conſtant logarithm,	-	11.10151
ſo is the difference of longitude	354	2.54900
to the difference of log. tangents.	6693	3.82562

Lat. left, 16° 54′ comp. 73° 6′ half 36° 33′ tang. 9.87000
Diff. log tang. 6693

Lat. in, 25 8 64 52 32 20 tang. 9.80307

Diff. of lat. 8 14=494m.

To find the diſtance.

As radius - -	-	10.0000
is to the ſecant of the courſe	3 points,	10.08015
ſo is the difference of latitude	494	2.69373
to the diſtance -	594.1	2.77388

PROB. IX. Given one latitude, diſtance, and difference of longitude, to find the courſe, and other latitude.

RULE. To the arithmetical complement of the logarithm of the diſtance, add the logarithm of the difference of longitude in minutes, and the log. coſine of the given latitude, the ſum rejecting radius will be the log. ſine of the approximate courſe.

To the given latitude taken as a courſe in the traverſe table, and half the difference of longitude in a diſtance column, the correſponding departure will be the firſt correction of the courſe, which is ſubtractive if the given latitude is the leaſt of the two; otherwiſe, additive.

In Table A, under the complement of the courſe, and oppoſite to the firſt correction in the ſide column, is the ſecond correction. In the ſame table find the number anſwering to the courſe at the top, and difference of longitude in the ſide column; and ſuch part of this number being taken as is found in table B oppoſite to the given latitude, will be the third correction. Now theſe two corrections, ſubtracted from the courſe corrected by the firſt correction, will give the true courſe.

Now the courſe and diſtance being known, the difference of latitude is found as formerly.

TABLE A.

Arc.	10°	20°	30°	40°	50°	60°	70°	80°	90°
1°	3′	1′	1′	1′	0′	0′	0′	0	0
2	12	6	4	2	2	1	1	0	0
3	27	13	8	6	4	3	2	1	0
4	47	23	14	10	7	5	3	1	0
5	74	36	23	16	11	8	5	2	0
6	107	52	33	22	16	11	7	3	0
7	145	70	44	30	21	15	9	4	0
8	190	92	58	40	28	19	12	6	0

A LE B.

Lat.	
0°	
10	$\frac{1}{3}$
20	$\frac{1}{3}$
30	$\frac{1}{6}+\frac{1}{7}$
40	$\frac{1}{6}+\frac{1}{8}$
50	$\frac{1}{6}+\frac{1}{9}$
60	$\frac{1}{4}$
70	$\frac{1}{7}$
80, &c.	$\frac{1}{6}+\frac{1}{5}$ $\frac{1}{6}$

EXAMPLE. From latitude 50° N, a ſhip ſailed 290 miles between the ſouth and weſt, and differed her longitude 5°. Required the courſe, and latitude come to?

Diſtance - -	290	ar. co. log.	7.53760
Diff. of longitude	300	log.	2.47712
Latitude -	50°	coſine	9.80807
Approximate courſe	41 41′	ſine	9.82279

To lat. 50°, and half diff. long. 150, the 1ſt Corr. in a dep. column is 115 +1 55

In table A to co. courſe 48° and 1ſt corr. 1° 55, the ſecond correction is } —0 2

To courſe 41° and diff. long. 5°, the number is 6′, of which ⅕ (Tab. B) being taken gives - - - } —0 1

True courſe		S. 43 33 W

To find the difference of latitude.

As radius - - -		10 00000
is to the coſine of the courſe	43° 33′	9.86020
ſo is the diſtance -	290	2.46240
to the difference of latitude	210.2	2.32260
Latitude left - - -		50° 0′ N
Difference of latitude - -		3 30 S
Latitude come to - -		46 30 N

It was intended in this place to have given rules, to make allowance for the ſpheroidal figure of the earth: but as the ratio of the polar to the equatorial ſemiaxis is not as yet determined with ſufficient accuracy, neither is it known if both hemiſpheres be ſimilar figures: therefore theſe rules would be grounded on aſſumption only, and which might probably err more from the truth than thoſe adapted to the ſpherical hypothesis. This therefore is ſuppoſed to be a ſufficient apology for not inſerting them.

CHAP. VIII. *Of Oblique Sailing.*

OBLIQUE ſailing is the application of oblique angled plane triangles to the ſolution of problems at ſea. This ſailing will be found particularly uſeful in going along ſhore, and in ſurveying coaſts and harbours, &c.

EXAMPLE I. At 11h A. M. the Girdleneſs bore WNW, and at 2h P. M. it bore NW*b*N; the courſe during the interval S*b*W 5 knots an hour. Required the diſtance of the Ship from the Neſs at each ſtation?

By Conſtruction.

Plate cccxxxviii. Deſcribe the circle NE.SW (fig. 38.) and draw the diameters NS. EW. at right angles to each other; from the centre C, which repreſents the firſt ſtation, draw the WNW line CF; and from the ſame point draw CH, S*b*W, and equal to 15 miles the diſtance ſailed.—From H draw HF in a NW*b*N direction, and the point F will repreſent the Girdleneſs. Now the diſtances CF, HF will meaſure 19.1 and 26.5 miles reſpectively.

By Calculation.

In the triangle FCH are given the diſtance CH 15 miles; the angle FCH equal to 9 points, the interval between the S*b*W and WNW points; and the angle CHF equal to 4 points, being the ſupplement of the angle contained between the S*b*W and NW*b*N points; hence CFH is 3 points; to find the diſtances CF, FH.

To find the diſtance CF.

As the ſine of CFH	3 points	9.74474
is to the ſine of CHF	4 points -	9.84948
ſo is the diſtance CH	15 miles -	1.17609
to the diſtance CF -	19.07 -	1.28083

To find the diſtance FH.

As the ſine of CFH -	3 points -	9.74474
is to the ſine of FCH -	9 points -	9.99157
ſo is the diſtance CH	15 miles -	1.17609
to the diſtance FH -	26.48 -	1.42292

EXAMPLE II. The diſtance between the SE point of the iſland of Jerſey and the iſland of Brehaut is 13 leagues; and the correct bearing and diſtance of Cape Frehel from the iſland of Brehaut is SE*b*E 26 miles. It is alſo known that the SE point of Jerſey bears NNE from Cape Frehel: from whence the diſtance of theſe two is required, together with the bearing of the ſaid point from the iſland of Brehaut?

By Conſtruction.

Deſcribe a circle, (fig. 39.) and draw two diameters at right angles, the extremities of which will repreſent the cardinal points, north being uppermoſt.—Let the centre B repreſent Brehaut, from which draw the SE*b*E line BF equal to 26 miles, and the point F will repreſent Cape Frehel, from which draw the NNE line FI: make BI equal to 39 miles: Then FI applied to the ſcale will meaſure 34½ miles, end the inclination of BI to the meridian will be found equal to 63°⅓.

By Calculation.

In the triangle BIF are given BI and BF equal to 39 miles, and 26 miles reſpectively; and the angle BFI equal to 7 points to find the ſide FI, and angle FBI.

To find the angle BIF.

As the diſtance BI -	39 -	1.59106
is to the diſtance BF -	26 -	1.41497
ſo is the ſine of BFI	78° 45′	9.99157
to the ſine of BIF -	40 50 -	9.81548
Sum - -	119 35	
Angle FBI -	60 25	
—— EBF -	33 45	
Difference, or EBI -	26 40	

Bearing of Jerſey from Brehaut N 63 20 E

To find the diſtance FI.

As the ſine of BFI	78° 45′ -	9.99157
is to the ſine of EBI	60 25 -	9.93934
ſo is the diſtance BI -	39 miles	1.59106
to the diſtance FI -	34.58 -	1.53883

EXAMPLE III. At noon Dungeneſs bore per compaſs N*b*W diſtance 5 leagues; and having run NW*b*W 7 knots an hour, at 5 P. M. we were up with Beachy-head. Required the bearing and diſtance of Beachy-head from Dungeneſs?

By Conſtruction.

Deſcribe a circle (fig. 40) to repreſent the horizon; from the centre C draw the N*b*W line CD equal to 15 miles; and the NW*b*W line CB equal to 35 miles; join DB, which applied to the ſcale will meaſure about 26½ miles; and the inclination of DB to the meridian will be found equal to N 79°¾ W.

By Calculation.

In the triangle DBC are given the diſtances CD, CB equal to 15 and 35 miles reſpectively; and the angle BCD equal to 4 points; to find the angles B and D, and the diſtance BD.

To

Oblique Sailing.

To find the angles.

Diſtance CB =	35	ſum of the ang.	16 points
CD =	15	angle C	4
Sum	50	angles B and D	12
Difference	20	half ſum -	6 pts. = 67° 30

As the ſum of the diſtances	50	1.69897
is to their difference -	20	1.30103
ſo is the tangent of half ſum angles	67 30	10.38378
to the tangent of half their differ.	44 0	9.98484
Angle CDB - -	111 30	
Supplement - -	68 30	
Angle NCD - -	11 15	

Magnetic bearing - N 79 45 W. Or by allowing 2¼ points of weſterly variation, the true bearing of Beachy-head from Dungeneſs will be W ¾ S nearly.

To find the diſtance.

As the ſine of CBD -	111° 30′	9.96868
is to the ſine of BCD -	45.0	9.84948
ſo is the diſtance BC -	35	1.54407
to the diſtance BD - -	26.6	1.42487

EXAMPLE IV. Running up Channel E*b*S *per* compaſs at the rate of 5 knots an hour. At 11h A. M. the Eddiſtone light-houſe bore N*b*E¼E and the Start point NE*b*E¼E; and at 4 P. M. the Eddiſtone bore NW*b*N, and the Start N½E. Required the diſtance and bearing of the Start from the Eddiſtone, the variation being 2¼ points W?

By Conſtruction.

Plate cccxxxviii.

Let the point C (fig. 41.) repreſent the firſt ſtation, from which draw the N*b*E¼E line CA, the NE*b*E¼E line CB, and the E*b*S line CD, which make equal to 25 miles, the diſtance run in the elapſed time; then from D draw the NW*b*N line DA interſecting CA in A, which repreſents the Eddiſtone; and from the ſame point draw the N½E line DB cutting CB in B, which therefore repreſents the Start. Now the diſtance AB applied to the ſcale will meaſure 22.9, and the bearing *per* compaſs BAF will meaſure 73°⅓.

By Calculation.

In the triangle CAD are given CD equal to 25 miles, the angle CAD equal to 4¼ points, the diſtance between N*b*E¼E and NW*b*N; and the angle ADC equal to 4 points, the diſtance between the NW*b*N and W*b*N points; to find the diſtance CA.

As the ſine of CAD	4¼ points	-	9.86979
is to the ſine of CDA	4 points	-	9.84948
ſo is the diſtance CD -	25 miles	-	1.39794
to the diſtance CA -	23.86	-	1.37763

In the triangle BCD are given the diſtance CD 25 miles, the angle CBD 4½ points the interval between NE*b*E¼E and N½E; and CDB 7¾ points, the diſtance between W*b*N and N½E; to find the diſtance CB.

As the ſine of CBD -	4½ points	-	9.88819
is to the ſine of CDB	7¾ points	-	9.99947
ſo is the diſtance CD	25 miles	-	1.39794
to the diſtance CB -	32.3	-	1.50922

In the triangle CAB, the diſtances CA, CB, are given, together with the included angle ACB, equal to 4 points, the diſtance between N*b*E¼E and NE*b*E¼E; to find the angle CAB and diſtance AB.

Diſtance CB	32.3	Angle ACB	= 45° 0′
Diſtance CA	23.86	Sum of CAB and ABC	135 0
Sum -	56.16	Half -	67 30
Difference	8.44		

As the ſum of the diſtances	56.16	-	1.[illegible]
is to their difference -	8.44	-	0.[illegible]
ſo is the tangent of half ſum angles -	67.30	-	10.[illegible]
to the tangent of half diff. angles -	19.56	-	9.[illegible]
Angle CAB -	87.26		
Angle CAF -	14 4		

Bearing *per* compaſs - S 73 22 E or ESE½E, and the variation 2¼ points being allowed to the left of ESE½E gives E¾N, the true bearing of the Start from the Eddiſtone.

To find the diſtance.

As the ſine of CAB -	87° 26′	-	9.99956
is to the ſine of ACB	45 0	-	9.84948
ſo is the diſtance CB -	32.3	-	1.50922
to the diſtance AB -	22.86		1.35914

EXAMPLE V. A ſhip from a port in latitude 57° 9′ N, longitude 2° 9′ W, ſailed 82 miles on a direct courſe, and ſpoke a ſhip that had run 100 miles from a port in latitude 56° 21′ N, longitude 2° 53′ W.—Required the courſe of each ſhip, and the latitude and longitude come to?

Lat. -	57° 9′ N	Mer. parts	4199	Lon.	2° 9′ W
——	56 21 N	———	4112	—	2 50 W
Diff. of lat.	48	Mer. diff. lat.	87	Diff. lon.	41

By Conſtruction.

With the meridional difference of latitude, the difference of longitude, and difference of latitude, conſtruct the triangles ADE, ABC (fig. 42.) as in Mercator's Sailing: then A will repreſent the northernmoſt, and C the ſouthernmoſt port. The diſtance AC applied to the ſcale will meaſure 53 miles, and the bearing BCA will be 25°¼. From the points A and C, with diſtances equal to 82 and 100 miles reſpectively, deſcribe arches interſecting each other in M, which will therefore be the place of meeting.—Now the angle ABM, the ſhip's courſe from the ſouthernmoſt port, will meaſure N 80°½ E; and the other ſhip's courſe, or angle BAM, will be 67°¾, or ESE. From M draw the parallel MNP, and AN will be the difference of latitude made by the one ſhip, and CP that by the other ſhip: hence either of theſe being meaſured and applied to its correſpondent latitude, will give 56° 38′, the latitude in. Make AF equal to 57, the meridional difference of latitude between the northernmoſt port and latitude in: from F draw FG perpendicular to AF, and produce AM to G, then FG will be the difference of longitude, which applied to the ſcale will meaſure 139; hence the longitude in, is 0° 10′ E.

By Calculation.

In the triangles ADE, ABC, are given AD equal to 87, DE equal to 41, and AB equal to 48; to find the angle BAC and diſtance AC.

To find the bearing of the ports.

As the meridional diff. of lat.	87	-	1.93952
is to the diff. of long. -	41	-	1.61278
ſo is radius -	-	-	10.00000
to the tangent of the bearing	25° 14'		9.67326

To find the diſtance of the ports.

As radius -	-	-	10.00000
is to the ſecant of the bearing -	25° 14'	-	10.04355
ſo is the diff. of latitude	48	-	1.68124
to the diſtance -	53.06	-	1.72479

In the triangle AMC, the three ſides are given to find the angles.

To find the angle ACM.

AM -	82			
MC -	100	ar. co. log.	-	8.00000
AC -	53.06	ar. co. log.	-	8.27523
Sum -	235.06			
Half -	117.53	- log.	-	2.07015
Difference -	35.53	- log.	-	1.55059
				19.89597
	27 29	- coſine		9.94798
Angle ACM	54 58			
Angle BAC	25 14			
Southermoſt ſhip's courſe	N 80 12 E			

To find the angle MAC.

As AM - -	82	-	1.91381
is to MC - -	100	-	2.00000
ſo is the ſine of ACM -	54 58	-	9.91319
to the ſine of MAC -	93 3	-	9.99938
Angle BAC -	25 14		
Northernmoſt ſhip's courſe -	S 67 49 E, or ESE.		

In the right-angled triangle AMN, given AM, and the angle MAN, to find the differences of latitude AN.

As radius - - -		-	10.00000
is to the coſine of the courſe	67° 49'	-	9.57700
ſo is the diſtance -	82	-	1 91381
to the diff. of lat.	30.96	-	1.49081
Latitude of northernmoſt port	57 9	Mer. parts	4199
Latitude in -	56 38	Mer. parts	4142
Meridional difference of latitude -			57

To find the difference of longitude FG.

As radius - -			10.00000
is to the tangent of the courſe -	67° 49'	-	10.38960
ſo is the mer. diff. of lat.	57	-	1.75587
to the diff. of long. -	139.8		2.14547
Longitude left - - -	2° 9' W		
Difference of longitude -	2 20 E		
Longitude in - -	0 11 E		

Chap. IX. *Of Windward Sailing.*

Windward ſailing is, when a ſhip by reaſon of a contrary wind is obliged to ſail on different tacks in order to gain her intended port; and the object of this ſailing is to find the proper courſe and diſtance to be run on each tack.

Example I. A ſhip is bound to a port 48 miles directly to the windward, the wind being SSW, which it is intended to reach on two boards; and the ſhip can lie within 6 points of the wind. Required the courſe and diſtance on each tack?

By Conſtruction.

Draw the SSW line CB (fig. 43.) equal to 48 miles. Make the angles ACB, ABC, each equal to 6 points. Hence the firſt courſe will be W, and the ſecond SE: alſo the diſtance CA, or AB, applied to the ſcale will meaſure 62¼ miles, the diſtance to be ſailed on each board.

Plate CCCXXXVIII.

By Calculation.

From A draw AD perpendicular to BC; then in the triangle ADC are given CD, equal to 24 miles; and the angle ACD, equal to 6 points, to find the diſtance AC.

As radius -	-	-	10.00000
is to the ſecant of C -	6 points	-	10.41716
ſo is CD -	24 miles	-	1.38021
to CA -	62.7	-	1.79737

Example II. The wind at NW, a ſhip bound to a port 64 miles to the windward, propoſes to reach it on three boards; two on the ſtarboard, and one on the larboard tack, and each within 5 points of the wind. Required the courſe and diſtance on each tack?

By Conſtruction.

Draw the NW line CA (fig. 44.) equal to 64 miles; from C draw CB W*b*S, and from A draw AD parallel thereto, and in an oppoſite direction; biſect AC in E, and draw BED parallel to the N*b*E rhumb, meeting CB, AD in the points B and D: then CB=AD applied to the ſcale will meaſure 36¼ miles, and BD=2CB=72½ miles.

By Calculation.

From B draw BF perpendicular to AC; then in the triangle BFC are given the angle BCF equal to 5 points, and CF equal to one fourth of CA=16 m. to find CB.

As radius -	-	-	10.00000
is to the ſecant of BCF, -	5 points		10.25526
ſo is CF - . -	16 m.		1.20412
to CB - -	36.25		1.55938

Example III. A ſhip which can lie within 5½ points of the wind, is bound to a port 36 miles to the windward, the wind being NE*b*N, which it is intended to reach

Windward Sailing.

reach on four boards, the firſt being on the larboard tack. Required the courſe and diſtance on each?

By Conſtruction.

Plate cccxxxviii.

Draw the NE*b*N line CA (fig. 45) equal to 36 miles, and biſect it in B; from C and B draw lines parallel to the E½S rhumb; and from A and B draw lines parallel to the SSE½E point, meeting the former in the points D and E. Now the diſtances AD, BD, BE, and CE, are equal; and any one of them applied to the ſcale will meaſure 19.1 miles.

By Calculation.

From E draw EF perpendicular to AC; and in the triangle CFE are given CF=9 m. and the angle FCE =5½ points, to find CE.

As radius	- - -		10.00000
is to the ſecant of FCE	-	5½ points	10.32661
ſo is CF	-	9 miles	0.95424
to the diſtance CE	-	19.1 miles	1.28085

Example IV. A ſhip bound to a port bearing N*b*W diſtant 40 miles, with the wind at N*b*E ½ E, intends to reach it on two boards. Required the courſe and diſtance on each tack, the ſhip lying within 5½ points of the wind?

By Conſtruction.

Draw the N*b*W line CA (fig. 46.) equal to 40 miles; and becauſe the wind is N*b*E ½ E, and the ſhip can lie within 5½ points of the wind, the courſe on the larboard tack will be E*b*N, and on the ſtarboard NW. Therefore, from the centre C draw the E*b*N line CB, and from it draw the NW line AB, meeting CB in B; then CB and AB applied to the ſcale will meaſure 26.7 and 48.1 m. reſpectively.

By Calculation.

In the triangle ACB, given AC = 40 miles, and the angles A, B, and C, equal to 3, 5, and 8 points reſpectively, to find AB and BC.

To find the diſtance CB.

As the ſine of B	-	5 points	9.91985
is to the ſine of A	-	3 points	9.74474
ſo is the diſtance CA	-	40 miles	1.60206
to the diſtance CB	-	26.73	1.42695

To find the diſtance AB.

As the ſine of B	-	5 points	9.91985
is to the ſine of C	-	8 points	10.00000
ſo is the diſtance CA	-	40 miles	1.60206
to the diſtance AB	-	48.11	1.68221

Example V. A ſhip cloſe hauled within 5 points of the wind, and making one point of lee-way, is bound to a port bearing SSW, diſtant 54 miles, the wind being S*b*E: It is intended to make the port at three boards, the firſt of which muſt be on the larboard tack in order to avoid a reef of rocks. Required the courſe and diſtance on each tack?

By Conſtruction.

Draw the SSW line CA (fig. 47.) equal to 54 m. and as the wind is S*b*E, and the ſhip makes her courſe good within 6 points of the wind, therefore the courſe on the larboard tack will be SW*b*W, and on the ſtarboard E*b*S: hence from C draw the SW*b*W line CB, and from A draw AD parallel thereto; biſect CA in E. and draw BED parallel to the E*b*S line; then will CB and AD be the diſtances on the larboard tack, which applied to the ſcale, each will be found to meaſure 37.4; and the diſtance on the ſtarboard tack BD will meaſure 42.4 miles.

By Calculation.

The triangles CBE, EAD are equal and ſimilar: hence in the firſt of theſe are given CE, equal to 27 miles, half the diſtance between the ſhip and port; the angles C, B, and E, equal to 3, 4, and 9 points reſpectively, to find CB and BE.

To find CB, the diſtance on the larboard tack.

As the ſine of B	- -	4 points	9.84948
is to the ſine of E	-	9 points	9.99157
ſo is the diſtance CE	-	27 miles	1.43136
to the diſtance BC	- -	37.45	1.57345

To find BE half the diſtance on the ſtarboard tack.

As the ſine of B	- -	4 points	9.84948
is to the ſine of C	- -	3 points	9.74474
ſo is the diſtance CE	-	27 miles	1.43136
to the diſtance BE	-	21.21	1.32662
Whole diſtance AC	-	42.42	

Example VI. A ſhip plying to the windward, with the wind at NNE, after failing 51 miles on each of two tacks, found by obſervation to have made 36 miles of difference of latitude. How near the wind did ſhe make her way good?

By Conſtruction.

Make CA (fig. 48.) equal to 36 miles; draw AB perpendicular to CA, and draw the NNE line CB, meeting AB in B; make CD, BD each equal to 51 miles; and theſe being meaſured, will be found equal to 6 points.

By Calculation.

In the triangles CAB, BCD, are given AB equal to 36m. CD=BD=51, and the angle ACB equal to 2 points, to find the angle BCD.

As the diſtance CD	-	51	1.70757
is to the diff. of latitude CA		18	1.25527
ſo is the ſecant of ACB	-	2 points	10,03438
to the coſine of BCD	-	67° 32′	9.58208

Example VII. A ſhip that makes her way good within 6½ points of the wind, reaches her port on two boards; the firſt being on the larboard tack 25 miles, and the other on the ſtarboard tack 38 miles; and the difference of latitude is 21 miles north. Required the bearing of the port, and direction of the wind?

By Conſtruction.

With the given diſtances 25 and 38 miles and the included angle equal to 16—2×6½=3 points, conſtruct the triangle BCD (fig. 49.); hence CB will be known. Draw CA equal to 21 miles, the given difference of latitude; from A draw AB perpendicular to CA, and make CB equal to what it was before determined; make DE=DC, and draw the line CE, which will repreſent the direction of the wind, and the angle ACB is the bearing of the port: now ACE will be found equal to 52° ½, and ACB 18°.

By Calculation.

In the triangle BCD are given BC=25m. BD=38m. and the angle D=3 points, to find the angle BCD, and diſtance CB.

To

Windward ſailing.

To find the angle BCD.

Diſtance	BD=38	Angle BDC	33° 45′
	BC=25	BCD+CBD	146 15
Sum	63	$\frac{BCD+CBD}{2}$	=73 7½
Difference	13		

As the ſum. of the ſides	63	1.79934
is to the difference of the ſides	13	1.11394
ſo is the tang. of half ſum angles	73° 7½′	10.51806
to the tang. of half diff. angles	34 13¾	9.83266
Angle BCD	107 21	

To find the diſtance BC.

As the ſine of BCD	107° 21′	9.97978
is to the ſine of BDC	33 45	9.74474
ſo is the diſtance BD	38	1.57978
to the diſtance BC	22.12	1.34474

To find the angle ACB, the bearing of the port.

As the diſtance BC	22.12	1.34474
is to the diſtance AC	21.	1.32222
ſo is radius		10.00000
to the coſine of ACB	18° 17′	9.97748
Angle BCD	107 21	
——ACD	125 38	
——DCE	73 7	
Direction of the wind	N 52 31 E	

CHAP X. *Of Current Sailing.*

THE computations in the preceding chapters have been performed upon the aſſumption that the water has no motion. This may no doubt anſwer tolerably well in thoſe places where the ebbings and flowings are regular, as then the effect of the tide will be nearly counterbalanced. But in places where there is a conſtant current or ſetting of the ſea towards the ſame point, an allowance for the change of the ſhip's place ariſing therefrom muſt be made: And the method of reſolving theſe problems, in which the effect of a current, or heave of the ſea, is taken into conſideration, is called *current ſailing*.

In a calm, it is evident a ſhip will be carried in the direction and with the velocity of the current. Hence, if a ſhip ſails in a direction of the current, her rate will be augmented by the rate of the current; but in ſailing directly againſt it, the diſtance made good will be equal to the difference between the ſhip's rate as given by the log and that of the current. And the abſolute motion of the ſhip will be a head, if her rate exceeds that of the current: but if leſs, the ſhip will make ſternway. If the ſhip's courſe be oblique to the current, the diſtance made good in a given time will be repreſented by the third ſide of a triangle, whereof the diſtance given by the log, and the drift of the current in the ſame time, are the other ſides; and the true courſe will be the angle contained between the meridian and the line actually deſcribed by the ſhip.

EXAMPLE I. A ſhip ſailed NNE at the rate of 8 knots an hour, during 18 hours, in a current ſetting NW*b*W 2½ miles an hour—Required the courſe and diſtance made good?

Current ſailing.

By Conſtruction.

Plate cccxxxix.

Draw the NNE-line CA (fig. 50), equal to 18×8 =144 miles; and from A draw AB parallel to the NW*b*W rhumb, and equal to 18×2½=45 miles: now BC being joined will be the diſtance, and NCB the courſe. The firſt of theſe will meaſure 159 miles, and the ſecond 6° 23′.

By Calculation.

In the triangle ACB, are given AC=144 miles, AB=45 miles, and the angle CAB=9 points, to find BAC and BC.

To find the courſe made good.

Diſt. AC	144	Ang. BAC=9 pts=	101° 15′
Diſt. AB	45		
		B+C	78 45
Sum	189	$\frac{B+C}{2}$	39 22½
Diff.	99		

As the ſum of the ſides	189	2.27646
is to the difference of the ſides	99	1.99563
ſo is the tan. of half ſum angles	39 22½	9.91417
to the tan. of half diff. angles	23 15½	9.63334
Angle ACB	16 7	
Angle ACN	22 30	
Courſe made good	N 6 23 E	

To find the diſtance.

As the ſine of ACB	16° 7′	9.44341
is to the ſine of CAB	101 15	9.99157
ſo is the diſtance AB	45	1.65321
to the diſtance CB	159	2.20137

EXAMPLE II. A ſhip from a port in latitude 42° 52′ N, ſailed S*b*W½W 17 miles in 7 hours, in a current ſetting between the north and weſt; and then the ſame port bore ENE, and the ſhip's latitude by obſervation was 42° 42′ N. Required the ſetting and drift of the current?

By Conſtruction.

Draw the S*b*W½W line CA (fig. 51) equal to 17 miles, and make CB equal to 10 miles, the difference of latitude: through B draw the parallel of latitude BD, and draw the WSW line CD, interſecting BD in D: AD being joined, will repreſent the drift of the current, which applied to the ſcale will meaſure 20.2, and the angle DAE will be its ſetting, and will be found equal to 72°.

By Calculation.

In the triangle CBD, given CB=10 miles, and the angle BCD=6 points; to find the diſtance CD.

As radius		10.00000
is to the ſecant of BCD	6 points	10.41710
ſo is the diff. of lat. CB	10 miles	1.00000
to the diſtance CD.	26.13	1.41710

Again, in the triangle ACD are given the diſtance AC=17 miles, CD=26.13, and the angle ACD 4½ points; to find the remaining parts.

NAVIGATION. Plate CCCXXXVIII.

Fig. 28.

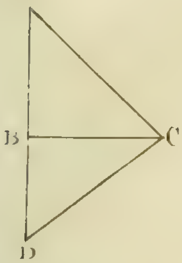


Fig. 29.

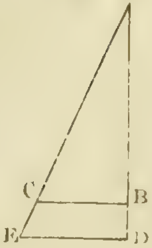


Fig. 30.

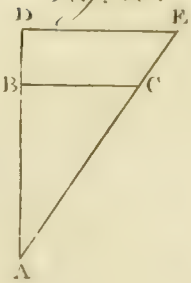


Fig. 31.

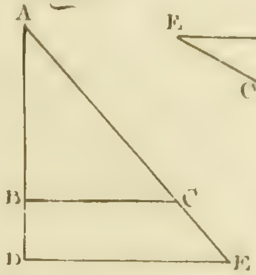


Fig. 32.

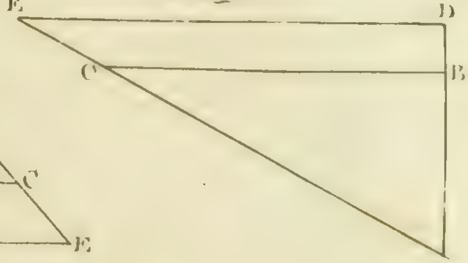


Fig. 33.

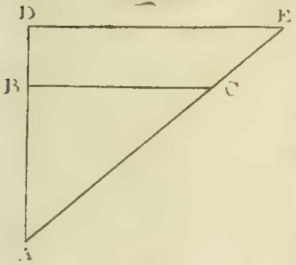


Fig. 34.

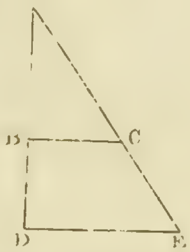


Fig. 35.

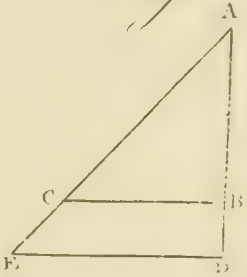


Fig. 36.

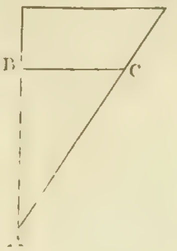


Fig. 37.

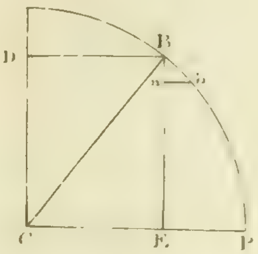


Fig. 38.

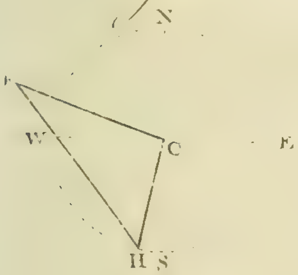


Fig. 39.

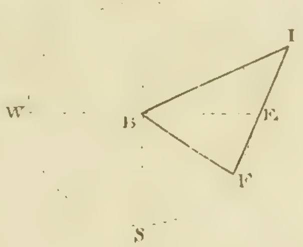


Fig. 40.

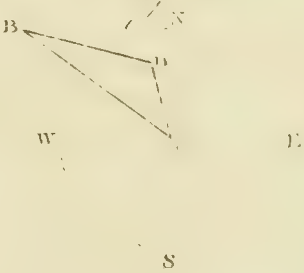


Fig. 41.

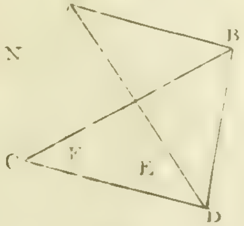


Fig. 42.

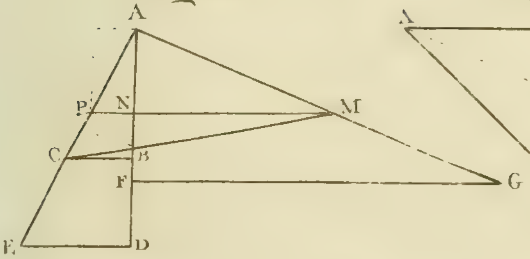


Fig. 43.

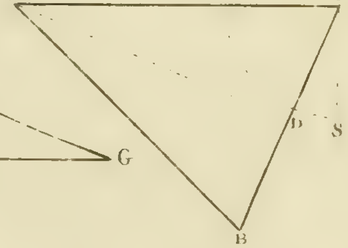


Fig. 44.

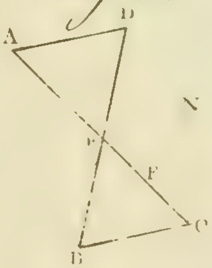


Fig. 45.

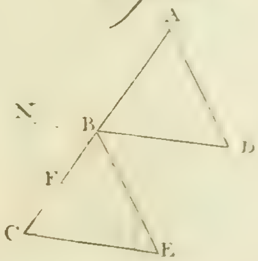


Fig. 46.

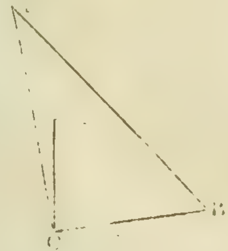


Fig. 47.

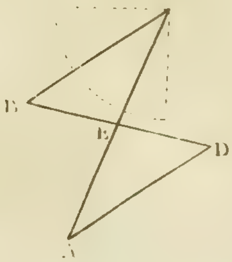


Fig. 48.

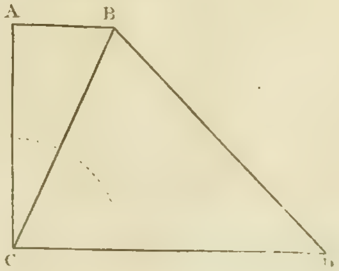
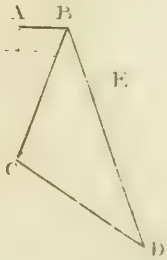


Fig. 49.



To find the ſetting of the current.

Diſtance DC = 26.13 Angle ACD = $4\frac{1}{2}$ points.
Diſtance AC = 17. 0 CAD+CDA $11\frac{1}{2}$

Sum - 43.13 $\frac{\text{CAD}+\text{CDA}}{2}$ $5\frac{3}{4}=64^\circ 41'$
Difference 9.13

As the ſum of the ſides	43.13	-	1.63478
is to the difference of the ſides -	9.13	-	0.96047
ſo is the tang. of half ſum angles -	64° 41′	-	10.32509
to the tang. of half diff. angles -	24 6	-	9.65078
Angle CAD -	88 47		
Angle CAE=ACB±$1\frac{1}{2}$ pt.=	16 52		
Setting of the current EAD=	71 55		

To find the drift of the current.

As the ſine of CAD -	88° 47′	-	9.99990
is to the ſine of ACD	$4\frac{1}{2}$ points		9.88819
ſo is the diſtance CD -	26.13	-	1.41710
to the drift of currt. AD	20.2	-	1.30539

Hence the hourly rate of the current is $\frac{20.2}{7}=2.9$ knots.

Example III. A ſhip, from latitude 38° 20′ N, ſailed 24 hours in a current ſetting NW*b*N, and by account is in latitude 38° 42′ N, having made 44 miles of eaſting; but the latitude by obſervation is 38° 58′ N. Required the courſe and diſtance made good, and the drift of the current?

By Conſtruction.

Plate cccxxxix. Make CE (fig. 52.) equal to 22 miles, the difference of latitude by D R, and EA=44 miles, the departure, and join CA; make CD=38 miles, the difference of latitude by obſervation; draw the parallel of latitude DB, and from A draw the NW*b*N line AB, interſecting DB in B, and AB will be the drift of the current in 24 hours; CB being joined, will be the diſtance made good, and the angle DCB the true courſe. Now, AB and CB applied to the ſcale, will meaſure 19.2 and 50.5 reſpectively; and the angle DCB will be $41^\circ\frac{1}{4}$.

By Calculation.

From B draw BF perpendicular to AE, then in the triangle AFB are given BF=16 miles, and the angle ABF=3 points; to find AB and AF.

To find the drift of the current AB.

As radius -		-	10.00000
is to the ſecant of ABF	3 points	-	10.08015
ſo is BF - -	16 miles		1.20412
to the drift of the current AB	19.24	-	1.28427

Hence the hourly rate = $\frac{19.24}{24}=0.8$.

To find AF.

As radius -		-	10.00000
is to the tangent of ABF -	3 points		9.82489
ſo is BF - -	16	-	1.20412
to AF - -	10.69		1.02901
Departure by account EH	44.		
True departure EF=DB=	33.31		

Now, in the triangle CDB are given the difference of latitude and departure; to find the courſe and diſtance.

To find the courſe.

As the difference of latitude CD	38.	1.57978
is to the departure DB -	33.31	1.52257
ſo is radius - -		10.00000
to the tangent of the courſe	41° 14′	9.94279

To find the diſtance.

As radius - -		10.00000
is to the ſecant of the courſe	41° 14′	10.12376
ſo is the difference of latitude	38	1.57978
to the diſtance - -	50.53	1.70354

Example IV. In the Straits of Sunda, at 2 P. M. ſteering SE*b*S at the rate of 5 knots an hour, I paſſed cloſe by the SE of the ſmall iſland off Hog point. At 6, not having changed our courſe, came to anchor on the Java ſhore. Upon ſetting the ſaid iſland from this anchoring place, I find it bears due north, its diſtance by the chart being 22 miles. It follows from hence, that our courſe has been affected by a current. Required its velocity and direction?

By Conſtruction.

From A (fig. 53.) draw the SE*b*S line AB=20, which will repreſent the ſhip's apparent tract through the water; draw AC equal to 22 miles ſouth, and C will be the ſhip's real place; and BC being joined will be the current's drift in four hours; which applied to the ſcale will meaſure 12.3; from A draw AD parallel to BC, and the angle CAD will be the direction of the current, and will be found to meaſure $64^\circ\frac{1}{5}$

By Calculation.

In the triangle ABC, given BB=20 m. AC=22 m. and the included angle A=3 points; to find the remaining parts.

To find the ſetting of the current.

Diſtance AC=22 m. Included angle = 3 points.
—— AB = 20 B+C = 13

Sum - 42 $\frac{B+C}{2}=6\frac{1}{2}p=73.7\frac{1}{2}$
Difference 2

As the ſum of the ſides	42	-	1.62325
is to the difference of the ſides -	2	-	0.30103
ſo is the tangent of half ſum angles	73° 7′$\frac{1}{2}$	-	10.51806
to the tangent of half diff. angles	8 55$\frac{1}{2}$	-	9.19584
Setting of the current	S 64 12 W, or SW*b*W$\frac{3}{4}$W.		

To find the drift of the current.

As the ſine of ACB -	64° 12′	-	9.95440
is to the ſine of BC	33 45	-	9.74474
ſo is the diſtance AB	20	-	1.30103
to the velocity of current BC -	12.34	-	1.09137

and $\frac{12.34}{4}=3.1$, its hourly rate.

Example V. A ſhip bound from Dover to Calais, lying

Current Sailing.

lying 21 miles to the SE*b*E½E, and the flood tide ſetting NE½E 2½ miles an hour. Required the courſe ſhe muſt ſteer, and the diſtance run by the log at 6 knots an hour to reach her port?

By Conſtruction.

Plate cccxxxix.

In the poſition of the SE*b*E½E rhumb, draw DC =21 miles (fig. 54.); draw DE NE½E=2½ miles; from E with 6 miles cut DC in F; draw DB parallel to EF, meeting CB drawn parallel to DE: then the diſtance DB applied to the ſcale will meaſure 19.4, and the courſe SDB will be SE½S.

By Calculation.

In the triangle DBF, given DE=2½ miles, EF =6 miles, and the angle EDF=6 points; to find the angle DFE=CBD.

As the hourly rate of ſailing	6 m.	0.77815
is to the hourly rate of the current -	2½ m.	0.39794
ſo is the ſine of EDF=6 points -	67° 30′	9.96562
to the ſine of DFE -	22 38	9.58541
Angle - SDC=5½ points=	61 52	
Courſe SDB - -	39 14=SE½S.	

In the triangle DBC, given DC=21 miles, the angle BDC=DFE=22° 38, and the angle DCB= DEF=6 points; to find the diſtance DB.

As the ſine of DBC -	89° 52′ -	9.99999
is to the ſine of DCB -	67 30 -	9.96562
ſo is the true diſtance DC -	21 m.	1.32222
to the diſtance by the log DB.	19.4 m.	1.28785

Example VI. A ſhip at ſea in the night has ſight of Scilly light, bearing NE*b*N, diſtant 4 leagues, it being then flood tide, ſetting ENE 2 miles an hour. What courſe and diſtance muſt the ſhip ſail to make the Lizard, which bears from Scilly E½S, diſtance 17 leagues?

By Conſtruction.

Draw the NE*b*N line AS=12 miles (fig. 55.); hence S will repreſent Scilly; from S draw SL=51 miles, and parallel to the E½S rhumb, then L will repreſent the Lizard; draw LC parallel to the ENE rhumb, and equal to 2 miles, and make CD=5 miles; from A draw AB parallel to CD, meeting LC produced in B; then AB will be the diſtance, and the angle SAB the courſe: the firſt of theſe applied to the ſcale will meaſure 41.9 miles, and the courſe will be S 88° E.

By Calculation.

In the triangle SAL are given the ſides AS, SL =12 and 51 miles reſpectively, and the angle ASL =10½ points; to find the other parts.

To find the angles.

Diſtance SL=51 m.	Angle ASL=10½ points.		
——— AS=12 m.	SAL+SLA= 5½		
Sum - 63 m.	$\frac{SAL+SLA}{2}=2\frac{3}{4}=30° 56'$		
Difference 39 m.			
As the ſum of the ſides	63	-	1.79934
is to the diff. of the ſides	39	-	1.59106
ſo is the tangent of half ſum angles -	30° 56′	-	9.77763
to the tang. of half their difference -	20 21	-	9.56935
Angle SAL -	=51 17		
NAS=3 points	33 45		
NAL - -	85 2		
LAE=FLA -	4 58		
FLB=2 points	22 30		
ALB=DLC -	17 32		

Inſtruments to ſolve Problems in Sailing, independent of Calculation.

To find the diſtance AL.

As the ſine of SAL -	51° 17′ -	9.89223
is to the ſine of ASL -	10½ points	9.94543
ſo is the diſtance SL -	51 miles	1.70757
to the diſtance AL -	57.64 -	1.76077

Again, in the triangle DLC, are given the ſide DC=5 miles, the ſhip's run in an hour; LC=2 miles, the current's drift in the ſame time; and the angle DLC=17° 32′; to find the angle LDC=LAB.

As the diſt. -	LC=5 miles -	0.69897
is to the diſtance	LC=2 miles -	0.30103
ſo is the ſine of	DLC=17° 32′ -	9.47894
to the ſine of -	LDC 6 55 -	9.08100
Angle NAL - -	85 2	
NAB -	91 57	
Courſe - -	S 88 3 E	

In the triangle ABL, the ſide AL, together with the angles, are given, to find the diſtance AB.

As the ſine of ABL -	155° 33′ -	9.61689
is to the ſine of ALB -	17 32 -	9.47894
ſo is the diſtance AL -	57.64 -	1.76077
to the diſtance AB -	41.96 -	1.62282

Chap. XI. *Inſtruments propoſed to ſolve the various Problems in Sailing, independent of Calculation.*

Various methods, beſide thoſe already given, have been propoſed to ſave the trouble of calculation.—One of theſe methods is by means of an inſtrument compoſed of rulers, ſo diſpoſed as to form a right-angled triangle, having numbers in a regular progreſſion marked on their ſides. Theſe inſtruments are made of different materials, ſuch as paper, wood, braſs, &c. and are differently conſtructed, according to the fancy of the inventor. Among inſtruments of this kind, that by John Cook, Eſq; ſeems to be the beſt. A number of other inſtruments, very differently conſtructed, have been propoſed for the ſame purpoſe; of theſe, however, we ſhall only take notice of the rectangular inſtrument, by And. Mackay, A. M. F. R. S. E.

I. *Of* Cooke's *Triangular Inſtrument.*

Deſcription. The ſtock *a b c d* (fig. 56.) is a parallelepiped: The length from *a* to *b* is two feet, the breadth from *a* to *d* two inches, and the depth is one inch and a half. The ſtock is perforated longitudinally, ſo as to be capable of containing within it *e f*, a cylindrical piece of wood one inch diameter; *g h* is an aperture on the ſurface of the ſtock about a quarter of an inch wide, which diſcloſes one-twelfth part of the ſurface of the cylinder contained; the edge *d c* is divided into twelve parts, each of theſe is ſubdivided into ſix parts, and each of theſe again into ten parts. The ſurface of the cylinder is divided longitudinally into twelve parts, and on each of them is engraved a portion of a line of meridional parts 22 feet long, which contains the meridional parts for every minute from the equator as far towards the pole as navigation is practicable; and the ſmalleſt diviſion on is not leſs than [illegible]th of an inch. By rolling and ſliding this cylinder, any part of any line on it may be brought into any poſition which may be required: the box *i* is engrooved into the edge of the ſtock *a b*, ſo that it may move freely from *a* to *b*; a limb from this box extends to *k*, which ſerves to mark that degree of the perpendicular *i l* which is parallel to the centre of the ſemicircle *m*; *i l* is two feet long, and graduated on both edges as the ſtock; it is perpendicular to the ſtock, and is fixed in the box *i*, by which it may be moved from *a* to *b*; *o p n* is a ſemicircle of ſix inches radius, engraved, as appears in the plate, which ſlides freely from *c* to *d* in a groove in the edge of the ſtock *c d*; *m q* is the index moving on the centre *m*, the edge of which marks the courſe on the ſemicircle; it is two feet long, and divided into 72 parts; and theſe are ſubdivided in the ſame manner as thoſe on the ſtock and perpendicular, to which they are equal; *r* is a vernier attached to the index to ſhow minutes; *S* is a vernier compoſed of concentric ſemicircles, which ſlides along the edge *q m*, to the interſection of the perpendicular and index, where it ſerves as a vernier to both; below *x* is a ſmall piece of ivory, with a mark on it to point out the degree of the line *d c*, which is perpendicularly under the centre of the ſemicircle. Fig. 57. is a view of the back part of the inſtrument. Plate cccxxxix.

Uſe. The method of working every caſe which occurs in navigation, is to make the inſtrument ſimilar to that ideal triangle which is compoſed of the difference of latitude, departure, and diſtance; or, to that compoſed of the meridional difference of latitude, difference of longitude, and enlarged diſtance; or, to that compoſed of the difference of longitude, departure, and ſine, of the middle latitude; which is done by means of the data procured from the compaſs, log-line, and quadrant: whence it follows, from the nature of ſimilar triangles, or from the relation which exiſts between the ſides of triangles and the ſines of their oppoſite angles, that the parts of the inſtrument become proportional to thoſe which they repreſent; and will aſcertain the length of the lines, or the extent of the angles ſought, by its graduations.

In the practice of this inſtrument, a ſmall ſquare is neceſſary, in order to bring the centre of the ſemicircle perpendicularly over the meridional degree correſponding to the latitude.

Plane Sailing.

Prob. I. The courſe and diſtance ſailed being given, to find the difference of latitude and departure.

Example. A ſhip from latitude 24° 18′ N ſailed NW *b* N 168 miles. Required the latitude come to, and departure?

Set the centre of the ſemicircle perpendicularly over the given latitude 24° 18′, and the index to the courſe 3 points; move the perpendicular until it cut the index at the given diſtance 168; then at the point of interſection on the perpendicular is 93.3 miles, the departure, and on the baſe, by the edge of the box, is 26° 38′, the latitude come to.

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Prob. II. Both latitudes and courſe given, to find the diſtance and departure.

Exampll. Let the latitude ſailed from be 43° 50′ N, that come to 47° 8′ N, and the courſe NNE. Required the diſtance and departure?

Move the centre of the ſemicircle to the latitude left 43° 50′, and the edge of the box to the latitude come to 47° 8′; fix the index at the given courſe 2 points: then at the point of interſection of the index and perpendicular is the diſtance 214 miles on the index, and the departure 82 miles on the perpendicular.

Prob. III. Given the courſe and departure, to find the diſtance and difference of latitude.

Example. Let the latitude ſailed from be 32° 38′ N, the courſe SW*b*S, and the departure 200 miles. Required the diſtance and latitude come to?

Move the centre of the ſemicircle to the latitude left 32° 38′, ſet the index to the given courſe 3 points, and move the perpendicular till the given departure 200 cuts the index; at this point on the index is 360 miles, and the edge of the box will cut the latitude come to 27° 39′ N.

Prob. IV. Given the difference of latitude and diſtance, to find the courſe and departure.

Example. Let the latitude left be 17° 10′ N, the latitude come to 21° 40′ N, and the diſtance ſailed on a direct courſe between the north and weſt 300 miles. Required the courſe and departure?

Move the ſemicircle and box to the given latitudes, and the index until the diſtance found thereon meets the perpendicular, then at the point of contact on the perpendicular is 130.8, the departure, and on the ſemicircle by the index is 25° 50′, the courſe.

Prob. V. The diſtance and departure given, to find the courſe and difference of latitude.

Example. The diſtance ſailed is 246 miles between the ſouth and eaſt, the departure is 138 miles, and the latitude left 51° 10′ N. Required the courſe and latitude come to?

Set the centre of the ſemicircle to 51° 10′, the latitude ſailed from; find the diſtance 246 on the index, and the departure 138 on the perpendicular; then move both till theſe points meet, and the courſe 34° 10′ will be found on the ſemicircle by the index, and the latitude in, 47° 47′ N, by the edge of the box.

Prob. VI. Both latitudes and departure given, to find the courſe and diſtance.

Examplle. A ſhip from latitude 43° 10′ N, ſailed between the north and weſt till ſhe is in latitude 47° 14′ N, and has made 170 miles of departure. Required the courſe and diſtance?

Move the centre of the ſemicircle over 43° 10′, and the edge of the box to 47° 14′; find the departure on the perpendicular, and bring the edge of the index thereto; now at the point of interſection is the diſtance 297.4 miles on the index, and the courſe 34° 52′ on the ſemicircle.

Traverſe Sailing.

Example. A ſhip from latitude 46 48′ N ſail-

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ed SSW½W 24 miles, S/W 36 miles, and S½E 40 miles. Required the latitude in, together with the direct courſe and diſtance?

Set the ſemicircle to the latitude ſailed from 46° 48′, and the index to the courſe SSW½W, mark the diſtance 24 on the index, and bring the perpendicular to meet it; then the index will cut the departure 11.3 on the perpendicular, and the perpendicular will cut the latitude 46° 27′ N on the baſe. For the next courſe and diſtance, bring the ſemicircle to the latitude marked by the perpendicular, and lay down the courſe S/W: if it be towards the firſt meridian, move the laſt marked departure until it meets the index, and the limb of the box will mark the preſent departure; but if the courſe be from the firſt meridian, bring the laſt departure 11.3 to the limb of the box, the index will mark the departure made good 18.3 on the perpendicular, and the latitude arrived at 45° 52′ will be marked on the baſe by the perpendicular; proceed in the ſame manner with all the courſes of which the traverſe conſiſts, then the difference of latitude 1° 36′ will be intercepted between the latitude ſailed from 46° 48′, and the latitude come to 45° 12′, laſt marked by the perpendicular; and alſo the departure made good will be intercepted between that point on the perpendicular where the firſt departure commenced, and that where the laſt terminated. Now, with the difference of latitude 1° 36′ and the departure, the courſe will be S 8° 30′ W, and diſtance 97 miles, by laſt problem in Plane Sailing.

Parallel Sailing.

Prob. I. The difference of longitude between two places in one parallel of latitude given, to find the diſtance between them.

Example. Let the common latitude be 49° 30′ N, and the difference of longitude 3° 30′. Required the diſtance?

Set the index to 40° 30′, the complement of the latitude on the ſemicircle; mark the difference of longitude in miles on the index; then move the perpendicular until it meets the termination of the difference of longitude on the index, and the part of the perpendicular intercepted between the limb of the box and the point of interſection will be the diſtance 136.4 miles.

Prob. II. The diſtance between two places in one parallel of latitude given, to find the difference of longitude between them.

Example. Let the latitude of the given parallel be 49° 30′ N, the diſtance ſailed 136.4 E. Required the difference of longitude?

Set the index to the complement of the latitude 40° 30′, and mark the diſtance ſailed on the perpendicular; then move it until it meets the index, and the point of interſection will ſhow the difference of longitude 210′ or 3° 30′ on the index.

Prob. III. Given the diſtance ſailed on a parallel, and the difference of longitude, to find the latitude of that parallel.

Example. The diſtance ſailed due eaſt is 136.4, and the difference of longitude 3° 30′. Required the latitude of that parallel?

Find the difference of longitude 210 on the index, and the diſtance 136.4 on the perpendicular, and move both until theſe numbers meet, and the complement of the latitude 40° 30′ will be ſhown by the index on the ſemicircle.

Mercator's and Middle Latitude Sailing.

Prob. I. The latitudes and longitudes of two places given, to find the direct courſe and diſtance between them.

Example. Required the courſe and diſtance between two places whoſe latitudes and longitudes are 50° 50′ N, 19° 0′ W, and 54° 30′ N, 15° 30′ W, reſpectively?

By Mercator's Sailing.

To find the courſe.

Move the centre of the ſemicircle perpendicularly over the meridional degree anſwering to latitude 50° 50′ N, then move the box until the edge of the perpendicular cuts the meridional parts of the other latitude 54° 30 N, and move the index until it cuts the difference of longitude 3° 30′ on the perpendicular, and the index will mark the courſe 30° 10′, or NNE¾E nearly, on the ſemicircle.

To find the diſtance.

Screw the index to this courſe, and move the centre of the ſemicircle to the latitude 50° 50′ N, and the edge of the perpendicular to the latitude 54° 30′ N. then the perpendicular will cut the diſtance 254.7 on the index.

By Middle Latitude Sailing.

To find the departure.

Move the centre of the ſemicircle to the latitude 50° 50′ and the edge of the index to the complement of the middle latitude 37° 20′ on the ſemicircle; then move the box until the edge of the perpendicular interſects the termination of the difference of longitude 210 miles on the index, which point of interſection will mark the departure 128 on the perpendicular.

To find the courſe and diſtance.

Move the edge of the perpendicular to the other latitude 54° 30′, and the index until it cuts the departure 128 on the perpendicular; then will the perpendicular mark the diſtance on the index 254.7 miles, and the index will mark the courſe on the ſemicircle 30° 10′, or NNE¾E nearly.

Prob. II. Both latitudes and courſe given, to find the diſtance and difference of longitude.

Example. A ſhip from latitude 50° 50′ N, longitude 19° 0′ W, ſailed N 30′ 10′ E, until ſhe is in latitude 54° 30′ N. Required the diſtance and difference of longitude?

By Mercator's Sailing.

To find the difference of longitude.

Move the box and ſemicircle as in the former problem to the meridional parts of the given latitudes, then ſet the index to the courſe, and it will mark the difference of longitude 3° 30′ on the perpendicular: Hence the longitude in is 15° 30′ W.

To find the diſtance.

Move the perpendicular and ſemicircle to the given latitudes, and put the index to the given courſe; then the perpendicular will cut the diſtance 254.7 miles on the index.

By Middle Latitude Sailing.

To find the diſtance and departure.

Move the ſemicircle and perpendicular to the given latitudes, and the index to the courſe; then the perpendicular will ſhow the departure 128 miles, and the

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Fig. 50.

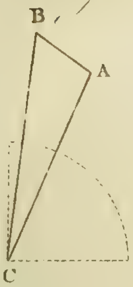

Fig. 51.

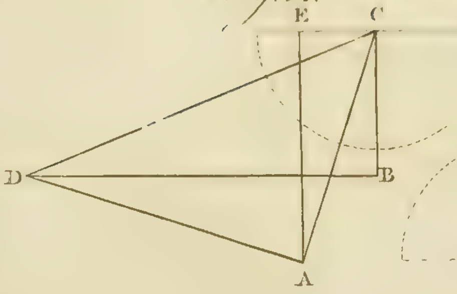

Fig. 52.

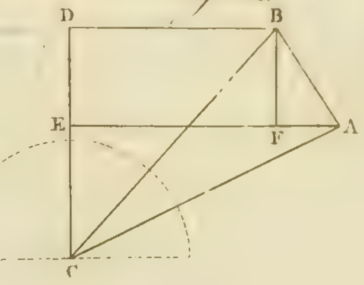

Fig. 53.

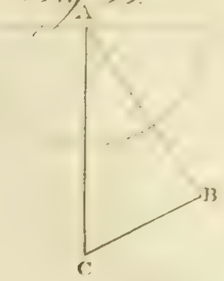

Fig. 54.

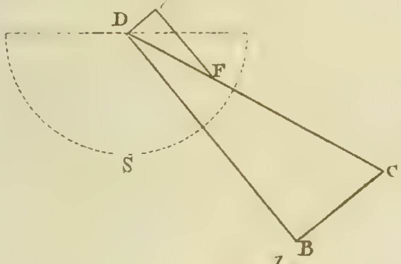

Fig. 55.

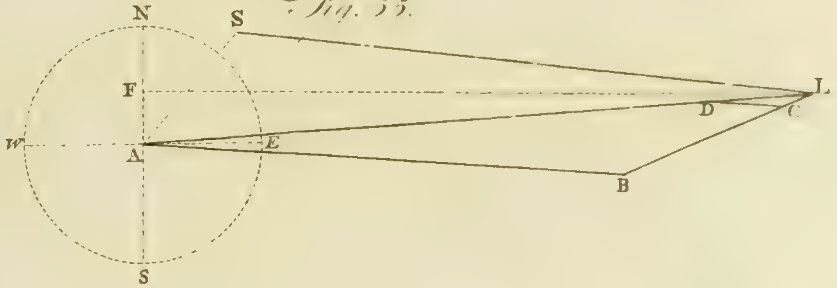

Fig. 56.

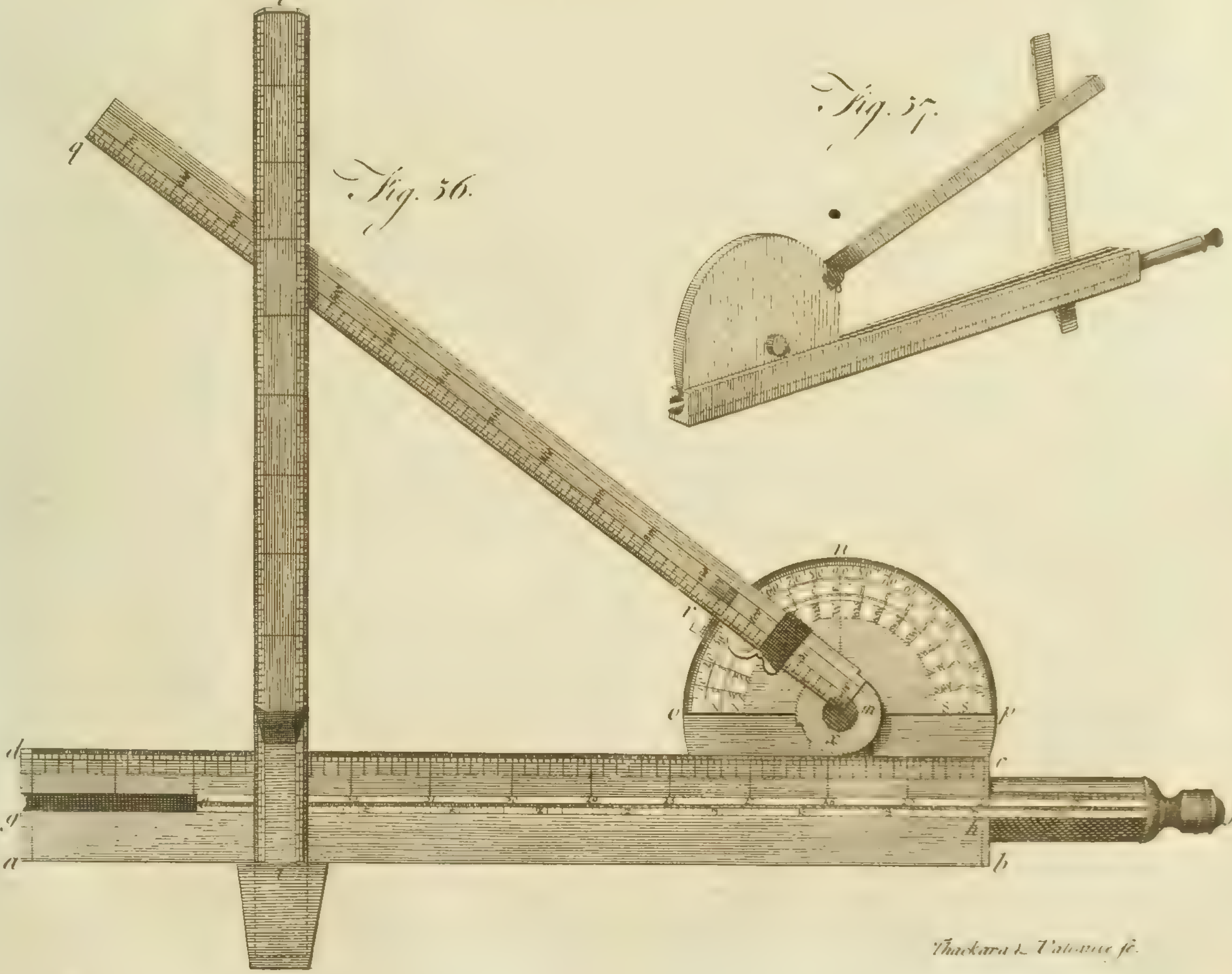

Fig. 57.

Thackara & Vallance sc.

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the index the diſtance 254.7 miles at the point of interſection.

To find the difference of longitude.

Set the index to the complement of the middle latitude on the ſemicircle, and move the box until the termination of the departure on the perpendicular meets the index, which will mark the difference of longitude thereon 210 m. or 3° 30′.

Prob. III. Both latitudes and diſtance given, to find the courſe and difference of longitude.

Example. From latitude 50° 50′ N, longitude 19° 0′ W, a ſhip ſailed 254.7 miles between the north and eaſt, and by obſervation is in latitude 54° 30′ N. Required the courſe and difference of longitude?

By Mercator's Sailing.

To find the courſe.

Move the perpendicular and ſemicircle to the given latitudes, and the index until the diſtance ſailed marked on it meets the perpendicular; then the index will mark the courſe N. 30° 10′ E. on the ſemicircle.

To find the difference of longitude.

Screw the index to the courſe, move the perpendicular and ſemicircle to the meridional parts of the given latitudes, and the ſpace intercepted between the limb of the box and the index will be the difference of longitude 3° 30′.

By Middle Latitude Sailing.

To find the departure and courſe.

Move the ſemicircle and perpendicular to the given latitudes, and the index until the diſtance ſailed on it cuts the perpendicular; then the perpendicular will ſhow the departure 128 miles, and the ſemicircle the courſe N 30° 10′ E.

To find the difference of longitude.

Set the index to 37° 20′, the complement of the middle latitude on the ſemicircle, and move the perpendicular until the termination of the departure on it cuts the index; then the point of interſection will mark the difference of longitude 210 miles on the index.

Prob. IV. Both latitudes and departure given, to find the courſe, diſtance, and difference of longitude.

Example. Let the latitude and longitude ſailed from be 56° 40′ S and 28° 55′ E reſpectively, the latitude come to 61° 20′ S, and departure 172 miles. Required the courſe, diſtance, and difference of longitude?

By Mercator's Sailing.

To find the courſe and diſtance.

Move the perpendicular and ſemicircle to the given latitudes (H); then move the index till it meets the extremity of the departure on the perpendicular; the diſtance will be marked on the index 329, and the courſe S 31° 55′ E or SSE¾E nearly on the ſemicircle.

To find the difference of longitude.

Move the perpendicular and ſemicircle to the Meridional parts of the given latitudes, and the index will cut the difference of longitude on the perpendicular 5° 35′.

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By middle Latitude Sailing.

The courſe and diſtance is found as before.

To find the difference of Longitude.

Set the index to 31°, the complement of the middle latitude on the ſemicircle, and move the perpendicular until the departure marked on it cuts the index, and this point of interſection will mark the difference of longitude on the index 335 m. or 5° 35′.

Prob. V. One latitude, courſe, and diſtance given, to find the difference of latitude and difference of longitude.

Example. Let the latitude left be 56° 40′ S, longitude 28° 55′ E, the courſe S 31° 35′ E, and diſtance 328 m. Required the latitude and longitude come to?

By Mercator's Sailing.

To find the latitude come to.

Set the ſemicircle to the latitude ſailed from, and the index to the courſe, and bring the perpendicular to the diſtance, which at the ſame time will mark the latitude come to 61° 20′ S.

To find the difference of longitude.

Screw the index to the courſe, and move the ſemicircle and perpendicular to the meridional parts of both latitudes; then the index will cut the difference of longitude on the perpendicular 5° 35′.

By Middle Latitude Sailing.

The latitude arrived at is found as above.

To find the departure.

The ſemicircle and perpendicular being ſet to both latitudes, and the index to the courſe, it will ſhow the departure 172.7 on the perpendicular.

To find the difference of longitude.

Set the index to 31°, the complement of the middle latitude on the ſemicircle, and move the perpendicular until the departure marked on it cuts the index, and the diviſion on the index at the point of interſection will be the difference of longitude 335.

Prob. VI. One latitude, courſe, and departure, given, to find the diſtance, difference of latitude, and difference of longitude.

Example. Let the latitude ſailed from be 56° 40′ N, longitude 28° 35′ W, the courſe N 31° 35′ W, and departure 172.7 Required the diſtance, and the latitude and longitude come to?

By Mercator's Sailing.

To find the diſtance and latitude come to.

Move the ſemicircle to the latitude left, and the index to the courſe; mark the departure on the perpendicular, and move it until the termination thereof meets the index; then the point of interſection will ſhow the diſtance 329 miles on the index, and the perpendicular will ſhow the latitude arrived at 61° 20′ N on the baſe.

To find the difference of longitude.

Screw the index, and move the perpendicular and ſemicircle to the meridional parts of both latitudes, then the index will cut the difference of longitude 5° 35′ on the perpendicular.

By Middle Latitude Sailing.

Find the diſtance ſailed and latitude in as above, and

(H) In ſouthern latitudes, the end of the cylinder where the numbers begin muſt be turned towards the north, pointed out by the ſemicircle; and in northern latitudes, it muſt be reverſed.

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and the difference of longitude as in Problem IV. by middle latitude ſailing.

Prob. VII. One latitude the diſtance ſailed, and departure given, to find the courſe, difference of latitude, and difference of longitude.

Example. The latitude ſailed from is 48° 30′ N, and longitude 14° 40′ W, the diſtance run is 345 miles between the ſouth and eaſt, and the departure 200 miles. Required the courſe, and the latitude and longitude come to?

By Mercator's Sailing.

To find the courſe and latitude come to.

Move the ſemicircle to the latitude left, mark the diſtance on the index, and the departure on the perpendicular, move both until theſe points meet; then will the index ſhew the courſe 35° 26 E on the ſemicircle, and the latitude come to 43° 49′ on the baſe.

The difference of longitude is found as in the preceding problem.

By Middle Latitude Sailing.

The courſe and latitude come to are found as above, and the difference of longitude as in Problem IV. by middle latitude ſailing.

Plate CCCXL.

II. *Of* Mackay's *Rectangular Inſtrument.*

Deſcription. Fig. 58. is a repreſentation of this inſtrument, of about one-third of the original ſize—The length CA is divided into 100 equal parts, and the breadth CB into 70; but in this plate every ſecond diviſion only is marked, in order to avoid confuſion; through theſe diviſions parallels are drawn, terminating at the oppoſite ſides of the inſtrument. Upon the upper and right-hand ſides are two ſcales; the firſt contains the degrees of the quadrant, and the other the points and quarters of the compaſs. M is an index moveable about the centre C, and divided in the ſame manner as the ſides (1). Fig. 59. is a portion of the enlarged meridian, ſo conſtructed that the firſt degree is equal to three diviſions on the inſtrument, and therefore, in the uſe of this line, each diviſion on the inſtrument is to be accounted 20 minutes. The ſize of the plate would not admit of the continuation of the line.

Uſe. From a bare inſpection of this inſtrument, it is evident that any triangle whatever may be formed on it. In applying it to nautical problems, the courſe is to be found at top, or right hand ſide, in the column of degrees or points, according as it is expreſſed; the diſtance is to be found on the index, the difference of latitude at either ſide column, and the departure at the head or foot of the inſtrument. The numbers in theſe columns may repreſent miles, leagues, &c.; but when uſed in conjunction with the enlarged meridional line, then 10 is to be accounted 100 miles, 20 is to be eſteemed 200 miles, and ſo on, each number being increaſed in a tenfold ratio; and the intermediate numbers are to be reckoned accordingly.

Plane Sailing.

Prob. I. The courſe and diſtance ſailed given, to find the difference of latitude and departure.

Example. Let the courſe be NE ½ N, diſtance 44 miles. Required the difference of latitude and departure?

Move the index until the graduated edge be over 3½ points, and find the given diſtance 44 miles on the index: this diſtance will be found to cut the parallel of 34 miles, the difference of latitude in the ſide column, and that of 28 miles, the departure at the top.

Prob. II. Given the courſe and difference of latitude, to find the diſtance and departure.

Example. Required the diſtance and departure anſwering to the courſe 28°, and difference of latitude 60 miles?

Lay the index over the given courſe 28°; find the difference of latitude 60 miles in the ſide column; its parallel will cut the index at 68 miles, the diſtance and the correſponding departure at the top is 32 miles.

Prob. III. The courſe and departure given, to find the diſtance and difference of latitude?

Example. Let the courſe be SSW. and the departure 36 miles. Required the diſtance and difference of latitude?

Lay the index over two points; find the departure at the top, and its parallel will cut the index at 94 miles the diſtance, and the difference of latitude on the ſide column is 87 miles.

Prob. IV. Given the diſtance and difference of latitude, to find the courſe and departure.

Example. The diſtance is 35 leagues, and the difference of latitude 30 leagues. Required the courſe and departure?

Bring 35 leagues on the index to the parallel of 30 leagues in the ſide; then the departure at the top is 18 leagues and the courſe by the edge of the index on the line of rhumbs is 2¾ points.

Prob. V. Given the diſtance and departure, to find the courſe and difference of latitude.

Example. Let the diſtance be 58 miles, and the departure 15 miles. Required the courſe and difference of latitude?

Move the index until 58 found thereon cuts the parallel of 15 from the top: this will be found to interſect the parallel of 56 miles, the difference of latitude; and the courſe by the edge of the ruler is 15°.

Prob. VI. The difference of latitude and departure being given, to find the courſe and diſtance.

Example. Let the difference of latitude be 30 miles, the departure 28 miles. Required the courſe and diſtance?

Bring the index to the interſection of the parallels of 30 and 28; then the diſtance on the index is 41 miles, and the courſe by its edge is 43°.

Traverſe Sailing.

Find the difference of latitude and departure anſwering to each courſe and diſtance by Problem I. of Plane Sailing, and from thence find the difference of latitude and departure made good; with which find the courſe and diſtance by the laſt problem.

An example is unneceſſary.

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(1) In the original inſtrument are two ſlips, divided like the ſide and end of the inſtrument. One of theſe ſlips is moveable in a direction parallel to the ſide of the inſtrument, and the other parallel to the end.

Inſtruments to ſolve Problems in Sailing, independent of Calculation.

Parallel Sailing.

PROB. I. Given the difference of longitude between two places on the ſame parallel, to find the diſtance between them.

EXAMPLE. Let the latitude of a parallel be 48°, and the difference of longitude between two places on it 3° 40, Required their diſtance?

Put the index to 48°, the given latitude, and find the difference of longitude 220 on the index, and the correſponding parallel from the ſide will be 147, the diſtance required.

PROB. II. The latitude of a parallel, and the diſtance between two places on that parallel, being given, to find the difference of longitude between them.

EXAMPLE. The latitude of a parallel is 56°, and the diſtance between two places on it 200 miles. Required their difference of longitude?

Put the index to the given latitude, and find the diſtance in the ſide column, and the interſection of its parallel with the index will give 358, the difference of longitude ſought.

PROB. III. Given the diſtance and difference of longitude between two places on the ſame parallel, to find the latitude of that parallel.

EXAMPLE. The number of miles in a degree of longitude is 46.5. Required the latitude of the parallel?

Bring 60 on the index to cut the parallel of 46.5 from the ſide, then the edge of the index will give 39° 11′, the latitude required.

Middle Latitude and Mercator's Sailing.

PROB. I. The latitudes and longitudes of two places being given, to find the courſe and diſtance between them.

EXAMPLE. Required the courſe and diſtance between Genoa, in latitude 44° 25′N, longitude 8° 36E, and Palermo, in latitude 38° 10′N, longitude 13° 38′ E.?

By Mercator's Sailing.

Take the interval between 38° 10′ and 44° 25′ on the enlarged meridian, which laid off from C upwards will reach to 500; now find the difference of longitude 302 at the top, and bring the divided edge of the index to the interſection of the correſponding parallels, and the index will ſhow the courſe 31° 8′ on the line of degrees; then find the difference of latitude 375 on the ſide column, and its parallel will interſect the index at 438, the diſtance.

By Middle Latitude Sailing.

Put the index to 41° 18′, the complement of the middle latitude on degrees, and the difference of longitude 302 on the index will interſect the parallel of 227, the departure, in the ſide column. Now move the index to the interſection of the parallels of 375 and 227, the firſt being found in the ſide column, and the other at top or bottom; then the diſtance anſwering thereto on the index will be 438, and the courſe on the ſcale of degrees is 41° 10′.

PROB. II. Given one latitude, courſe, and diſtance, to find the other latitude and difference of longitude.

EXAMPLE. Let the latitude and longitude ſailed from be 39° 22′ N. and 12° 8′ W. reſpectively, the courſe NNW$\frac{1}{2}$W. and diſtance 500 miles. Required the latitude and longitude come to?

By Mercator's Sailing.

Put the index to the courſe 2$\frac{1}{2}$ points, and find the diſtance 500 miles thereon; then the correſponding difference of latitude will be 441 miles, and the departure 235$\frac{1}{2}$ miles: hence the latitude in is 46° 43 N Now take the interval between the latitudes of 39° 22′ and 46° 43 on the enlarged meridian, which laid off from C will reach to about 605, the parallel of which will interſect the vertical parallel of the difference of longitude 323 at the edge of the index: hence the longitude in is 17° 31 W.

By Middle Latitude Sailing.

Find the difference of latitude and departure as before, and hence the latitude in is 46° 43′N, and the middle latitude 43° 3′. Now put the index to 43° 3′, and the horizontal parallel of the departure 235$\frac{1}{2}$ will interſect the index at 322, the difference of longitude.

PROB. III. Both latitudes and courſe given, to find the diſtance aud difference of longitude.

EXAMPLE. The latitude ſailed from is 22° 54′ S, and longitude 42° 40′ W, the courſe is SE by E, and latitude come to 26° 8′ South. Required the diſtance ſailed, and longitude in?

By Mercator's Sailing.

Bring the index to 5 points, the given courſe, and the parallel of 194 the difference of latitude found in the ſide column will interſect the index at 349, the diſtance; and it will cut the vertical parallel of 290, the departure.

Take the interval between the given latitudes 22° 54′ and 26° 8′ on the enlarged meridian; lay off that extent from the centre on the ſide column, and it will reach to 213: the parallel of this number will interſect the vertical parallel of 319, the difference of logitude. Hence the longitude in is 37° 21′W.

By Middle Latitude Sailing.

With the given courſe and difference of latitude find the diſtance and departure as before; then bring the index to the middle latitude 24° 31′; find the departure 290 in the ſide column, and its parallel will interſect the index at 319, the difference of longitude.

PROB. IV. One latitude courſe, and departure, given, to find the other latitude, diſtance, and difference of longitude.

EXAMPLE. The latitude and longitude left are 20° 30′ N. and 49° 17′ W. reſpectively; the courſe is NE$\frac{3}{4}$N, and departure 212 miles. Required the latitude and longitude come to, and diſtance ſailed?

By Mercator's Sailing.

Put the index to the given courſe 3$\frac{1}{4}$ points, and the vertical parallel of 212 will cut the index at 256, the diſtance, and the horizontal parallel of 286, the difference of latitude; the latitude come to is therefore 25° 16′ N.

Now take the interval between the latitudes 20° 30′, and 25° 16′ on the enlarged meridian, which laid off from the centre C will reach to 311; and this parallel will interſect the vertical parallel of the difference of longitude 230, at the edge of the index. Hence the longitude in is 45° 27 W.

By Middle Latitude Sailing.

Find the diſtance and difference of latitude as directed above; then bring the index to 22° 53′, the middle latitude, and the horizontal parallel of 212, the departure,

Inſtruments to ſolve Problems in Sailing, independent of Calculation.

Inſtruments to ſolve Problems in Sailing, independant of Calculation

parture, will interſect the index at 230, the difference of longitude.

Prob. V. Both latitudes and diſtance given, to find the courſe and difference of longitude.

Example. The diſtance ſailed is 500 miles between the north and weſt; the latitude and longitude left are 40° 10'N, and 9° 20 W. reſpectively, and the latitude in is 46° 40 N. Required the courſe and longitude in?

By Mercator's Sailing.

Bring the diſtance 500 on the index to interſect the horizontal parallel of the difference of latitude 390; then the courſe 38° 44' is found on the line of degrees by the edge of the index, and the vertical parallel of the above point of interſection is that anſwering to 313, the departure.

Take the interval between the latitudes 40° 10', and 46° 40', which lay off from the centre C, and its horizontal parallel will interſect the vertical parallel of 431, the difference of longitude, by the edge of the index, it being in the ſame poſition as before. Hence the longitude in is 16° 31' W.

By Middle Latitude Sailing.

The courſe and departure are found as formerly, and the middle latitude is 43° 25', to which bring the edge of the index, and the horizontal parallel of 313, the departure, will interſect the index at 431, the difference of longitude.

Prob. VI. Both latitudes and departure given, to find the courſe, diſtance, and difference of longitude.

Example. Let the latitude ſailed from be 42° 52 N. long. 9° 17 W, the departure 250 miles W, and the latitude come to 36° 18'N. Required the courſe and diſtance ſailed, and the longitude come to?

By Mercator's Sailing.

Find the point of interſection of the horizontal parallel of 394, the difference of latitude, and the vertical parallel of 250, the departure; to this point bring the index, and the correſponding diviſion thereon will be 467 miles, and the courſe on the ſcale of degrees by the edge of the index will be 32° 24'

Take the interval between the latitudes on the enlarged meridian; which being laid off from the centre will reach to 512: now the horizontal parallel of 512 will cut the vertical parallel of 325, the difference of longitude, at the edge of the index. The longitude come to is therefore 14° 42' W.

By Middle Latitude Sailing.

The courſe and diſtance are to be found in the ſame manner as above. Then bring the index to 39° 35', the middle latitude, and the horizontal parallel of 250 will interſect the edge of the index at 324, the difference of longitude.

Prob. VII. Given one latitude, diſtance, and departure, to find the other latitude, courſe, and difference of longitude.

Example. A ſhip from latitude 32° 38'N. longitude 17° 6'W. ſailed 586 miles between the ſouth and weſt, and made 336 miles of departure:---Required the courſe, and the latitude and longitude come to?

By Mercator's Sailing.

Move the index till the diſtance 586 interſects the vertical parallel of the departure 336; then the correſponding horizontal parallel will be 480, the difference of latitude, and the courſe 35°. Hence the latitude in is 24° 38' N.

Now take the interval between the latitudes on the enlarged meridian, which laid off from the centre will reach to 547, the horizontal parallel of which will cut the vertical parallel of 383, the difference of longitude. The longitude in is therefore 23° 29 W.

By Middle Latitude Sailing.

Find the courſe and difference of latitude as before, and hence the middle latitude is 28° 38', to which bring the index, and the horizontal parallel of 336, the departure, will interſect the index at 383, the difference of longitude.

It ſeems unneceſſary to enlarge any further on the uſe of this inſtrument, as the above will make it ſufficiently underſtood.

Great Circle Sailing.

Chap. XII. *Of Great Circle Sailing.*

The application of ſpherical trigonometry to the ſolution of triangles formed upon the ſurface of the earth is called *Great Circle Sailing.*

The earth being ſuppoſed an exact ſphere, the ſhorteſt diſtance between two places is the arch of a great circle intercepted between them; and therefore the diſtance ſailed upon a direct courſe from one place to another, will always be longer than the arch of a great circle contained between them, except when the rhumb line coincides with a great circle, which can only happen when the ſhip ſails on a meridian or on the equator

Although it is impoſſible to make a ſhip deſcribe an arch of a great circle, yet ſhe may be kept ſo near it as to make the error almoſt inſenſible.

The terms that enter into this ſailing are, the latitudes of the places, their difference of longitude and diſtance, and the angles contained between the diſtance and the meridians of the places, called the *angles of poſition.*

Prob. I. Given the common latitude of two places on the ſame parallel, and their difference of longitude, to find the diſtance and angle of poſition (k).

Example. Required the diſtance between St Mary's, in latitude 36° 57' N, longitude 25° 9' W. and Cape Henry, in latitude 36° 57 N, and longitude 76° 27' W.

By Conſtruction.

Deſcribe the circle EPQS (fig. 60.) to repreſent the meridian of one of the places; draw the equator EQ and the earth's axis PS at right angles thereto; make ED, QA, each equal to the chord of 36° 57', the

Plate CCCXLI.

(k) This problem may be expreſſed thus:—Two places lying on the ſame parallel, and of theſe four, the latitude, difference of longitude, diſtance, and angle of poſition, any two being given to find the other two.——Now this problem contains four different caſes, the moſt uſeful of which is given above. The others ſerve rather as exerciſes in ſpherical trigonometry than of any real utility in navigation, and are therefore omitted. The ſame is to be underſtood of the following problems.

NAVIGATION. Plate CCCXL.

Fig 59.

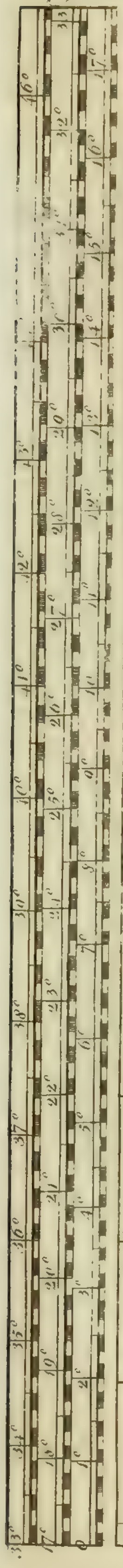
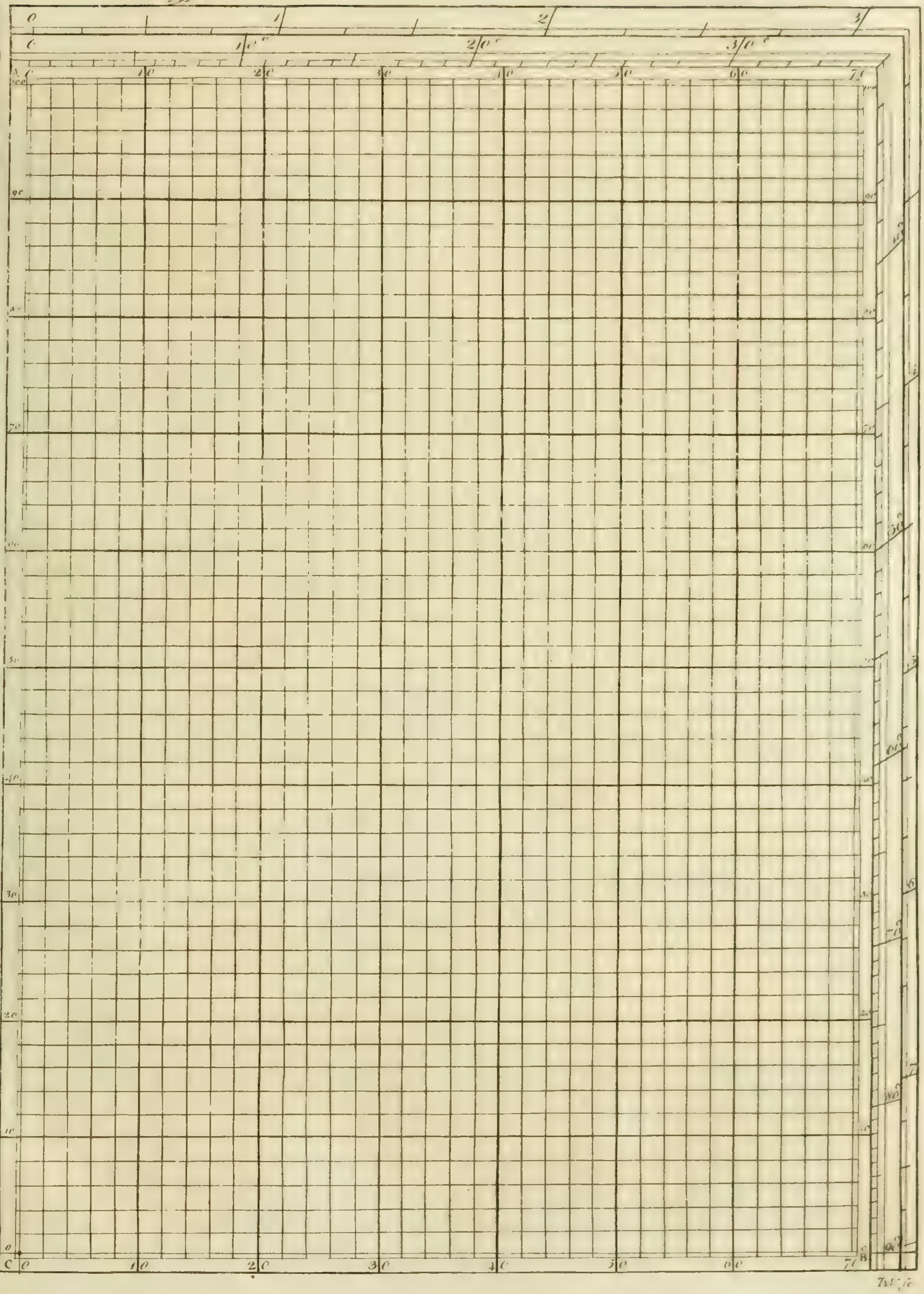


Fig 58



the given latitude, and draw the parallel of latitude ABD, the radius of which is the tangent of 53° 3', the co-latitude; deſcribe the meridian PBS with the ſecant of 51° 18' the difference of longitude; then A and B will be the two places. Draw the diameter AF, and through the points ABF deſcribe a great circle; then the arch AB will be the diſtance, and the angle PAB the angle of poſition. Now theſe being meaſured by the rules given in *ſpherics* will, be found equal to 40° 28' and 73° 54' reſpectively.

By Calculation.

From P draw PG perpendicular to AB, by deſcribing the arch with the ſecant of half the difference of longitude; then, in the right-angled ſpherical triangle AGP, are given AP = 53° 3' the complement of latitude, and the angle APG = 25° 39' half the difference of longitude; to find AG half the diſtance, and PAG the angle of poſition.

1. To find the diſtance.

As radius - -		10.00000
is to the ſine of AP	53° 3'	9.90263
ſo is the ſine of APG	25 39	9.63636
to the ſine of AG	20 14	9.53899
	2	
Diſtance AB	40 28	

2. To find the angle of poſition.

As radius - - -		10.00000
is to the coſine of AP	53° 3'	9.77896
ſo is the tangent of APG	25 39	9.68142
to the cotangent of PAG	73 54	9.46038

Prob. II. Given the latitude of a place, and the difference of longitude between it and a place on the equator, to find the diſtance between them, and the angles of poſition.

Example. Required the ſhorteſt diſtance between the iſland of St Thomas, in latitude 0° 0', longitude 1° 0' E, and Port of St Julian, in latitude 48° 51' S, and longitude 65° 10' W?

By Conſtruction.

Plate CCCXLI.

Deſcribe the circle EPQS (fig. 61.), to repreſent the meridian of one of the places; draw the equator EQ, and axis PS; make EB equal to the chord of 48° 51', and B will repreſent Port St Julian; make CA equal to the ſemitangent of the complement of the difference of longitude; draw the diameter BF, and through the points BAF draw the great circle BAF; then AB will be the diſtance, ABE the angle of poſition at Port St Julian, and BAE the complement of that at St Thomas. Theſe being meaſured by the rules given in ſpherics, will be found equal to 74° 35', 71° 36', and 51° 22'; reſpectively.

By Calculation.

In the right-angled ſpherical triangle AEB, AE, and EB are given, to find AB and the angles A and B.

1. To find the diſtance.

As radius - -		10.00000
is to to the coſine of AE	66° 10'	9.60646
ſo is the coſine of EB	48 51	9.81825
to the coſine of AB	74 35	9.42471

Now 74° 35' = 4475 miles, which is 57 miles leſs than the diſtance found by Mercator's Sailing.

2. To find the angle of poſition at St Thomas.

As radius - -		10.00000
is to the ſine of AE	66° 10'	9.96129
ſo is the cotangent of EB	48 51	9.94146
to the tang. ang. of poſition	38 38	9.90275

3. To find the angle of poſition at Port St Julian.

As radius - -		10.00000
is to the ſine EB	48° 51'	9.87679
ſo is the cotangent of AE	66 10	9.64517
to the cotangent of of ABE	71 36	9.52196

Hence a ſhip from St Thomas to Port St Julian muſt firſt ſteer S 38° 38' W, and then by conſtantly altering her courſe towards the weſt, ſo as to arrive at Port St Julian on a courſe S 71° 36' W, ſhe will have ſailed the ſhorteſt diſtance between thoſe places.

Prob. III. Given the latitudes and longitudes of two places, to find the diſtance between them, and the angles of poſition.

Example. What is the ſhorteſt diſtance between the Lizard, in latitude 49° 57' N, longitude 5° 15' W, and Bermudas, in latitude 32° 35' N, and longitude 63° 28' W?

By Conſtruction.

Deſcribe the primitive circle (fig. 62.) to repreſent the meridian of one of the places; make EA = 32° 35', and A will repreſent Bermudas; make E*a*, Q*b* each equal to 49° 57'; then with the tangent of the co-latitude 40° 3' draw the parallel of latitude of the Lizard, and with the ſecant of 58° 13', the given difference of longitude, draw the oblique circle PBS, interſecting the parallel of latitude in B; which will be the poſition of the Lizard. Draw the diameter AF, and through the points A, B, F, deſcribe a circle; and the arch AB will be the diſtance, and the angles A and B the angles of poſition, which are meaſured as before.

By Calculation.

In the oblique-angled ſpherical triangle APB are AP, BP, the co-latitudes, and the angle APB the difference of longitude; to find the diſtance AB, and the angles of poſition PAB, PBA.

1. To find the diſtance.

Difference of long.	58° 13'	verſed ſine	9.67513
AP -	57 25	ſine	9.92563
BP -	40 3	ſine	9.80852
Difference	17 22 nat. v. ſine 04559		
	25661		9.40928
Diſtance AB	45 45 nat. v. ſine 30220*.		

2. To find the angle of poſition at the Lizard.

As the ſine of AB	45° 45'	9.85510
is to the ſine of AP	57 25	9.92563
ſo is the ſine of P	58 13	9.92944
to the ſine of B	89 20	9.99997

3. To find the angle of poſition at Bermudas.

As the ſine of AB	45° 45'	9.85510
is to the ſine of BP	40 3	9.80852
ſo is the ſine of P	58 13	9.92944
to the ſine of A	49 47	9.88286

The ſhorteſt diſtance between the Lizard and Bermudas is 45° 45' or 2745 miles, which is 56 miles leſs than

* See Mackay's Treatiſe on the Longitude, where a complete Table of Nat. Verſed Sines is given.

than the diſtance found by Mercator's ſailing. And a ſhip to deſcribe the ſhorteſt tract muſt ſail from the Lizard S. 89° 20′ W, and gradually leſſen the courſe, ſo as to arrive at Bermudas on the rhumb bearing S. 49° 47′ W. The direct courſe by Mercator's ſailing is S. 68° 10′ W.

From the preceding examples, it is evident that in order to ſail on the arch of a great circle, the ſhip muſt continually alter her courſe. But as this is a difficulty too great to be admitted into the practice of navigation, it has been thought ſufficiently exact to effect this by a kind of approximation; the principle of which is, that in ſmall arches the difference between the arch and its chord or tangent is ſo ſmall, that the one may be ſubſtituted for the other in any nautical operations.

Upon this principle, the great circles on the earth are ſuppoſed to be made up of ſhort right lines, each of which is a ſegment of a rhumb line: and on this ſuppoſition the ſolution to the following problem is founded.

Prob. IV. Given the latitudes and longitudes of two places, to find the ſeveral points in a great circle paſſing through them, which alter in longitude from either of the places by a given quantity; together with the courſes and diſtances between thoſe points.

Rule. Compute the diſtance of the places, and their angles of poſition, by one of the preceding problems; find alſo the perpendicular from the pole to the great circle, paſſing through the given places, and the ſeveral angles at the pole made by the given alterations of longitude between the perpendicular and the ſucceſſive meridians come to.

With this perpendicular, and the polar angles ſeverally, find as many correſponding latitudes by the following analogy:

As rad. : co.tan-perp. : : coſ. 1ſt pol. ang. : tang. 1ſt lat.
: : coſ. 2nd pol. ang. : tang. 2nd lat.
&c. &c.

Now having the latitudes of the ſeveral points in the great circle, and the difference of longitude between each, find the ſeveral courſes and diſtances between them; and theſe will be the courſes and diſtances the ſhip muſt run to keep nearly on the arch of a great circle.

Example. I. A ſhip from a place in latitude 37° 0′ N, longitude 23° 0′ W, bound to a place in the ſame latitude, and in longitude 76° 27′ W, intends to ſail as near the arch of a great circle as ſhe can, by altering her courſe at every five degrees of longitude. Required the latitude of each point where the courſe is propoſed to be altered, and alſo the courſes and diſtances between thoſe points?

Plate CCCXLI.

The triangle APB (fig. 63.) being deſcribed, and the computation made as in Problem I. the diſtance will be found equal to 42° 6′, and the angle of poſition A or B=73° 9′.—Now the triangle APB being iſoſceles, the perpendicular PI falls in the middle of AB; and the latitudes, courſes, and diſtances being known in the half BI, thoſe in the half IA will alſo be known.

Let the points *a*, *b*, *c*, *d*, &c. be the points arrived at on each alteration of five degrees of longitude; then will the arches P*a*, P*b*, P*c*, P*d*, &c. be the reſpective co-latitudes of thoſe places, and are the hypothenuſes of the right-angled ſpherical triangles PI*a*, PI*b*, PI*c*, PI*d*, &c.

Now in the triangle PIB, given PB=53° 3′, the angle PBI=73° 9, to find PI.

As radius - - -		10.00000
is to the ſine of PBI	73° 9′	9.98094
ſo is the ſine of PB	53 0	9.90235
to the ſine of PI	49 51	9.88329

The angle $IPB=\left(\frac{53^\circ\ 27'}{2}\right)26^\circ\ 43'\frac{1}{2}$, angle $IPa=21^\circ 43'\frac{1}{2}$, $IPb=16^\circ 43'\frac{1}{2}$, $IPc=11^\circ 43'\frac{1}{2}$, $IPd=6^\circ 43'\frac{1}{2}$, are the ſeveral polar angles.

To find the latitude of the point *a*.

As radius		10.00000
is to the cotangent of PI	49° 51′	9.92612
ſo is the coſine firſt polar angle	21 43½	9.96800
to the tangent of 1ſt latitude	38 5	9.89412

By continuing the operation with the other polar angles, the ſuceeſſive latitudes from *a* to I will be 38° 56′, 39° 33′, 39° 57′

Now with the ſeveral latitudes, and reſpective differences of longitude, compute the courſes and diſtances. The reſults are entered in the following Table; the calculations being performed on a piece of waſte paper.

Polar Angles.	Succeſſive Long.	Diff. Long.	Succeſſive Lat.	Diff. Lat.	Meridian Parts.	Merid diff. lat,	Courſes.	Diſtances.
IPB=26° 43½′	23° 0′		37° 0′		2392.6			
IP*a*=21 43½	28 0	300	38 5	65	2474.6	82.0	74° 43′	246.6
IP*b*=16 43½	33 0	300	38 56	51	2539.8	65.2	77 44	240.2
IP*c*=11 43½	38 0	300	39 33	37	2587.6	47.8	80 57	235.3
IP*d*= 6 43½	43 0	300	39 57	24	2618.8	31.2	84 4	231.9
	49 43½	403.5	40 9	12	2634.5	15.7	87 46	309.1
								1263.1

The courſes, and the firſt diſtance, are found by Mercator's Sailing: but as the other courſes are near the parallel, the diſtances cannot be very exactly found by this method; another method is therefore uſed. The ſum of the diſtances is 1263.1, which doubled is 2526.2, agreeing with the diſtance found as before. It may be obſerved, that the diſtance found by this method cannot be leſs than the laſt diſtance, or that given by Great Circle Sailing, as ſome authors have found it.

Example II. A ſhip from the Lizard, in latitude 49° 57′ N, longitude 5° 15′ W, bound to a place in latitude 32° 25′ N, and longitude 66° 39′ W, propoſes to ſail on a great circle, and to alter her courſe at every

Great Circle Sailing.

Plate CCCXLI.

every five degrees of longitude. Required the latitudes of the places where the ſhip is to alter her courſe, and alſo the courſe and diſtance between each?

Having deſcribed the triangle (fig. 64.) and performed the computation as in Problem III. the diſtance AB is found =47° 54′, the angle of poſition PBA at the Lizard 87° 15′, and that at the place bound to 49° 35′.

Draw PI at right angles to AB. and in the equator lay off from the centre the tangents of 5, 10, 15, 20, &c. to 55 degrees, and theſe will be the centres of the arches of co-latitude to every 5° of difference of longitude.

To find the perpendicular PI.

As radius		10.00000
is to the ſine of PAB	49° 35′	9.88158
ſo is the ſine of PA	57 35	9.92643
to the ſine of PI	40 0	9 80801

To find the polar angle API.

As radius		10.00000
is to the coſine of AP	57° 35′	9.72922
ſo is the tangent of PAB	59 35	10.06978
to the co-tangent of API	57 49	5.79900

Now the polar angle API, or the difference of longitude between the perpendicular and the meridian of the place bound to, 57° 49′, being taken from 61° 24′, the whole difference of longitude, leaves 3° 35′ for the difference of longitude between the Lizard and the perpendicular: alſo 5°, the propoſed alteration of longitude, being ſubtracted as often as it can be from 57° 49, leaves the ſeveral polar angles; with which and the perpendicular PI the ſeveral latitudes arrived at are found as in the preceding example: then with theſe latitudes and the differences of longitude between them, find the ſucceſſive courſes and diſtances. The ſeveral reſults are placed in the following Table; the calculations being performed on a piece of waſte paper.

Polar Angles.	Succeſſive Longs.	Diff. Long.	Succeſſive Lats.	Diff. Lat.	Meridian Parts.	Merid. diff. lat.	Courſes.	Diſtances,
	5° 14′		49° 57′		3469.8			138.3
IPB= 3° 35′	8 49	215	50 0	3	3474.5	4.7	88° 45′	108.7
IP*a* = 2 49	11 38	169	49 58	2	3471.4	3.1	88 57	193.8
IP*b* = 7 49	16 38	300	49 45	13	3451.2	20.2	86 9	196.6
IP*c* =12 49	21 38	300	49 18	27	3409.6	41.6	82 6	201.4
IP*d*=17 49	26 38	300	48 37	41	3347.2	62.4	78 15	207.3
IP*e* =22 49	31 38	300	47 42	55	3264.7	82.5	74 37	216.3
IP*f*=27 49	36 38	300	46 31	71	3160.4	104.3	70 50	226.8
IP*g*=32 49	41 38	300	45 3	88	3034.2	126.2	67 10	239.8
IP*h*=37 49	46 38	300	43 17	106	2886.4	147.8	63 46	255.9
IP*i* =42 49	51 38	300	41 10	127	2714.9	171.5	60 15	273.9
IP*k*=47 49	56 38	300	38 41	149	2520.5	194.4	57 3	296.1
IP*l* =52 49	61 38	300	35 46	175	2300.7	219.8	53 46	319.6
	66 38	300	32 25	201	2058.0	242.7	51 2	
								2874.5

As the four firſt courſes are near the parallel, the correſponding diſtances were not found by Mercator's Sailing. The ſum of the diſtances 2874.5 agrees very well with, and is not leſs than, 47° 54′, or 2874 miles, the ſhorteſt diſtance between the places.

Chap. XIII. *Of Sea-Charts.*

Sea-Charts.

The charts uſually employed in the practice of navigation are of two kinds, namely, *Plane* and *Mercator's Charts*. The firſt of theſe is adapted to repreſent a portion of the earth's ſurface near the equator; and the laſt for all portions of the earth's ſurface. For a particular deſcription of theſe, reference has already been made from the article Chart, to thoſe of Plane and Mercator: and as theſe charts are particularly deſcribed under the above articles, it is therefore ſufficient in this place to deſcribe their uſe.

Uſe of the Plane Chart.

Prob. I. To find the latitude of a place on the chart.

Rule. Take the leaſt diſtance between the given place and the neareſt parallel of latitude: now this diſtance applied the ſame way on the graduated meridian, from the extremity of the parallel, will give the latitude of the propoſed place.

Thus the diſtance between Bonaviſta and the parallel of 15 degrees, being laid from that parallel upon the graduated meridian, will reach to 16° 5′, the latitude required.

Prob. II. To find the courſe and diſtance between two given places on the chart.

Rule. Lay a ruler over the given places, and take the neareſt diſtance between the centre of any of the compaſſes on the chart and the edge of the ruler; move this extent along, ſo as one point of the compaſs may touch the edge of the rule, and the ſtraight line joining their points may be perpendicular thereto; then will the other point ſhow the courſe: The interval between the places, being applied to the ſcale, will give the required diſtance.

Thus the courſe from Palma to St Vincent will be found to be about SSW ¾ W. and the diſtance 13°¼ or 795 m.

Prob. III. The courſe and diſtance ſailed from a known place being given, to find the ſhip's place on the chart.

Rule. Lay a ruler over the place ſailed from, parallel

Sea-Charts. rallel to the rhumb, expreſſing the given courſe: take the diſtance from the ſcale, and lay it off from the given place by the edge of the ruler; and it will give the point repreſenting the ſhip's preſent place.

Thus, ſuppoſe a ſhip had ſailed SW*b*W 160 miles from Cape Palmas; then by proceeding as above, it will be found that ſhe is in latitude 2° 57′ N.

The various other problems that may be reſolved by means of this chart require no further explanation, being only the conſtruction of the remaining problems in Plane Sailing on the chart.

Uſe of Mercator's Chart.

The method of finding the latitude and longitude of a place, and the courſe or bearing between two given places by this chart, is performed exactly in the manner as in the Plane Chart, which ſee.

Prob. I. To find the diſtance between two given places on the chart.

Case I. When the given places are under the ſame meridian.

Rule. The difference or ſum of their latitudes, according as they are on the ſame or on oppoſite ſides of the equator, will be the diſtance required.

Case II. When the given places are under the ſame parallel.

Rule. If that parallel be the equator, the difference or ſum of their longitudes is the diſtance; otherwiſe, take half the interval between the places, lay it off upwards and downwards on the meridian from the given parallel, and the intercepted degrees will be the diſtance between the places.

Or, take an equal extent of a few degrees from the meridian on each ſide of the parallel, and the number of extents, and parts of an extent, contained between the places, being multiplied by the length of an extent, will give the required diſtance.

Case III. When the given places differ both in latitude and longitude.

Rule. Find the difference of latitude between the given places, and take it from the equator or graduated parallel: then lay a ruler over the two places, and move one point of the compaſs along the edge of the ruler until the other point juſt touches a parallel; then the diſtance between the place where the point of the compaſs reſted by the edge of the ruler, and the point of interſection of the ruler and parallel, being applied to the equator, will give the diſtance between the places in degrees and parts of a degree, which multiplied by 60 will reduce it to miles.

Prob. II. Given the latitude and longitude in, to find the ſhip's place on the chart.

Rule. Lay a ruler over the given latitude, and lay off the given longitude from the firſt meridian by the edge of the ruler, and the ſhip's preſent place will be obtained.

Prob. III. Given the courſe ſailed from a known place, and the latitude in, to find the ſhip's preſent place on the chart.

Rule. Lay a ruler over the place ſailed from in the direction of the given courſe, and its interſection with the parallel of latitude arrived at will be the ſhip's preſent place.

Prob. IV. Given the latitude of the place left and the courſe and diſtance ſailed, to find the ſhip's preſent place on the chart.

Method of finding the Latitude and Longitude at Sea.

Rule. The ruler being laid over the place ſailed from and in the direction of the given courſe, take the diſtance ſailed from the equator, put one point of the compaſs at the interſection of any parallel with the ruler, and the other point of the compaſs will reach to a certain place by the edge of the ruler. Now this point remaining in the ſame poſition, draw in the other point of the compaſs until it juſt touch the above parallel when ſweeped round: apply this extent to the equator, and it will give the difference of latitude. Hence the latitude in will be known, and the interſection of the correſponding parallel with the edge of the ruler will be the ſhip's preſent place.

The other problems of Mercator's Sailing may be very eaſily reſolved by this chart; but as they are of leſs uſe than thoſe given, they are therefore omitted, and may ſerve as an exerciſe to the ſtudent.

BOOK II.

Containing the method of finding the Latitude and Longitude of a Ship at Sea, and the Variation of the Compaſs.

Chap. I. *Of Hadley's Quadrant.*

Hadley's quadrant is the chief inſtrument in uſe at preſent for obſerving altitudes at ſea. The form of this inſtrument, according to the preſent mode of conſtruction, is an octagonal ſector of a circle, and therefore contains 45 degrees; but becauſe of the double reflection, the limb is divided into 90 degrees. See Astronomy and Quadrant. Fig. 65. repreſents a quadrant of the common conſtruction, of which the following are the principal parts. Plate CCCXLI.

1. ABC, the frame of the quadrant.
2. BC, the arch or limb.
3. D, the index; *a b*, the ſubdividing ſcale.
4. E, the index-glaſs.
5. F, the fore horizon-glaſs.
6. G, the back horizon-glaſs.
7. K, the coloured or dark glaſſes.
8. HI, the vanes or ſights.

Of the Frame of the Quadrant.

The frame of the quadrant conſiſts of an arch BC, firmly attached to the two radii AB, AC, which are bound together by the braces L M, in order to ſtrengthen it, and prevent it from warping.

Of the Index D.

The index is a flat bar of braſs, and turns on the centre of the octant: at the lower end of the index there is an oblong opening; to one ſide of this opening the vernier ſcale is fixed, to ſubdivide the diviſions of the arch; at the end of the index there is a piece of braſs, which bends under the arch, carrying a ſpring to make the ſubdividing ſcale lie cloſe to the diviſions. It is alſo furniſhed with a ſcrew to fix the index in any deſired poſition. The beſt inſtruments have an adjuſting ſcrew fitted to the index, that it may be moved more ſlowly, and with greater regularity and accuracy, than by the hand. It is proper, however, to obſerve, that the index muſt be previouſly fixed near its right poſition by the abovementioned ſcrew.

Of the Index Glaſs E.

Upon the index, and near its axis of motion, is fixed a plane ſpeculum, or mirror of glaſs quickſilvered. It is ſet in a braſs frame, and is placed ſo that its face is perpendicular to the plane of the inſtrument. This mirror being fixed to the index moves along with it, and has its direction changed by the motion thereof; and the intention of this glaſs is to receive the image of the ſun, or any other object, and reflect it upon either of the two horizon-glaſſes, according to the nature of the obſervation.

The braſs frame with the glaſs is fixed to the index by the ſcrew *c*; the other ſcrew ſerves to re-place it in a perpendicular poſition, if by any accident it has been deranged.

Of the Horizon Glaſſes F, G.

On the radius AB of the octant are two ſmall ſpeculums: the ſurface of the upper one is parallel to the index glaſs, and that of the lower one perpendicular thereto, when *o* on the index coincides with *o* on the limb. Theſe mirrors receive the reflected rays, and tranſmit them to the obſerver.

The horizon-glaſſes are not entirely quickſilvered; the upper one F is only ſilvered on its lower half, or that next the plane of the quadrant, the other half being left tranſparent, and the back part of the frame cut away, that nothing may impede the ſight through the unſilvered part of the glaſs. The edge of the foil of this glaſs is nearly parallel to the plane of the inſtrument, and ought to be very ſharp, and without a flaw. The other horizon-glaſs is ſilvered at both ends. In the middle there is a tranſparent ſlit, through which the horizon may be ſeen.

Each of theſe glaſſes is ſet in a braſs frame, to which there is an axis paſſing through the wood work, and is fitted to a lever on the under ſide of the quadrant, by which the glaſs may be turned a few degrees on its axis, in order to ſet it parallel to the index-glaſs. The lever has a contrivance to turn it ſlowly, and a button to fix it. To ſet the glaſſes perpendicular to the plane of the inſtrument, there are two ſunk ſcrews, one before and one behind each glaſs: theſe ſcrews paſs through the plate on which the frame is fixed into another plate; ſo that by looſening one and tightening the other of theſe ſcrews, the direction of the frame with its mirror may be altered, and ſet perpendicular to the plane of the inſtrument.

Of the Coloured Glaſſes K.

There are uſually three coloured glaſſes, two of which are tinged red and the other green. They are uſed to prevent the ſolar rays from hurting the eye at the time of obſervation. Theſe glaſſes are ſet in a frame, which turns on a centre, ſo that they may be uſed ſeparately or together as the brightneſs of the ſun may require. The green glaſs is particularly uſeful in obſervations of the moon; it may be alſo uſed in obſervations of the ſun, if that object be very faint. In the fore-obſervations, theſe glaſſes are fixed as in fig. 65. but when the back-obſervation is uſed, they are removed to N. Plate CCCXLI.

Of the two Sight Vanes H, I.

Each of theſe vanes is a perforated piece of braſs, deſigned to direct the ſight parallel to the plane of the quadrant. That which is fixed at I is uſed for the fore, and the other for the back, obſervation. The vane I has two holes, one exactly at the height of the ſilvered part of the horizon-glaſs, the other a little higher, to direct the ſight to the middle of the tranſparent part of the mirror.

Of the Diviſions on the Limb of the Quadrant.

The limb of the quadrant is divided from right to left into 90 primary diviſions, which are to be conſidered as degrees, and each degree is ſubdivided into three equal parts, which are therefore of 20 minutes each: the intermediate minutes are obtained by means of the ſcale of diviſions at the end of the index.

Of the Vernier or ſubdividing Scale.

The dividing ſcale contains a ſpace equal to 21 diviſions of the limb, and is divided into 20 equal parts. Hence the difference between a diviſion on the dividing ſcale and a diviſion on the limb is one-twentieth of a diviſion on the limb, or one minute. The degree and minute pointed out by the dividing ſcale may be eaſily found thus.

Obſerve what minute on the dividing ſcale coincides with a diviſion on the limb; this diviſion being added to the degree and part of a degree on the limb, immediately preceding the firſt diviſion on the dividing ſcale, will be the degree and minute required.

Thus ſuppoſe the fourteenth minute on the dividing ſcale coincided with a diviſion on the limb, and that the preceding diviſion on the limb to *o* on the vernier was 56° 40′; hence the diviſion ſhown by the vernier is 56° 54′. A magnifying glaſs will aſſiſt the obſerver to read off the coinciding diviſions with more accuracy.

Adjuſtments of Hadley's Quadrant.

The adjuſtments of the quadrant conſiſt in placing the mirrors perpendicular to the plane of the inſtrument. The fore horizon-glaſs muſt be ſet parallel to the ſpeculum, and the planes of the ſpeculum and back horizon glaſs produced muſt be perpendicular to each other when the index is at *o*.

Adjustment I. To ſet the index-glaſs perpendicular to the plane of the quadrant.

Method I. Set the index towards the middle of the limb, and hold the quadrant ſo that its plane may be nearly parallel to the horizon: then look into the index-glaſs; and if the portion of the limb ſeen by reflection appears in the ſame plane with that ſeen directly, the ſpeculum is perpendicular to the plane of the inſtrument. If they do not appear in the ſame plane, the error is to be rectified by altering the poſition of the ſcrews behind the frame of the glaſs.

Method II. This is performed by means of the two adjuſting tools fig. 66, 67, which are two wooden frames, having two lines on each, exactly at the ſame diſtance from the bottom.

Place the quadrant in a horizontal poſition on a table; put the index about the middle of the arch; turn back the dark glaſſes; place one of the above-mentioned tools near one end of the arch, and the other at the oppoſite end, the ſide with the lines being towards the index-glaſs; then look into the index-glaſs, directing the ſight parallel to the plane of the inſtrument, and one of the tools will be ſeen by direct viſion, and the other by reflection. By moving the index a little, they may be brought exactly together. If the lines coincide, the poſition of the mirror is right; if not, they muſt be made to coincide by altering the ſcrews behind the frame, as before.

Adjustment II. To ſet the fore horizon-glaſs perpendicular to the plane of the inſtrument.

Set the index to *o*; hold the plane of the quadrant parallel to the horizon; direct the ſight to the horizon, and if the horizons ſeen directly and by reflection are apparently in the ſame ſtraight line, the fore horizon-glaſs is perpendicular to the plane of the inſtrument; if not, one of the horizons will appear higher than the other. Now if the horizon ſeen by reflection is higher than that ſeen directly, releaſe the neareſt ſcrew in the pedeſtal of the glaſs, and ſcrew up that on the farther ſide, till the direct and reflected horizons appear to make one continued ſtraight line. But if the reflected horizon is lower than that ſeen directly, unſcrew the fartheſt, and ſcrew up the neareſt ſcrew till the coincidence of the horizons is perfect, obſerving to leave both ſcrews equally tight, and the fore horizon-glaſs will be perpendicular to the plane of the quadrant.

Adjustment III. To ſet the fore horizon-glaſs parallel to the index-glaſs, the index being at *o*.

Set *o* on the index exactly to *o* on the limb, and fix it in that poſition by the ſcrew at the under ſide; hold the plane of the quadrant in a vertical poſition, and direct the ſight to a well-defined part of the horizon; then if the horizon ſeen in the ſilvered part coincides with that ſeen through the tranſparent part, the horizon-glaſs is adjuſted; but if the horizons do not coincide, unſcrew the milled ſcrew in the middle of the lever on the other ſide of the quadrant, and turn the nut at the end of the lever until both horizons coincide, and fix the lever in this poſition by tightening the milled ſcrew.

As the poſition of the glaſs is liable to be altered by fixing the lever, it will therefore be neceſſary to re-examine it, and if the horizons do not coincide, it will be neceſſary either to repeat the adjuſtment, or rather to find the error of adjuſtment, or, as it is uſually called, the *index error*; which may be done thus:

Direct the ſight to the horizon, and move the index until the reflected horizon coincides with that ſeen directly; then the difference between *o* on the limb and *o* on the vernier is the index error; which is additive when the beginning of the vernier is to the right of *o* on the limb, otherwiſe ſubtractive.

Adjustment IV. To ſet the back horizon-glaſs perpendicular to the plane of the inſtrument.

Put the index to *o*; hold the plane of the quadrant parallel to the horizon, and direct the ſight to the horizon through the back ſight vane. Now if the reflected horizon is in the ſame ſtraight line with that ſeen through the tranſparent part, the glaſs is perpendicular to the plane of the inſtrument; If the horizons do not unite, turn the ſunk ſcrews in the pedeſtal of the glaſs until they are apparently in the ſame ſtraight line.

Adjustment V. To ſet the back horizon glaſs perpendicular to the plane of the index-glaſs produced, the index being at *o*.

Let the index be put as much to the right of *o* as twice the dip of the horizon amounts to; hold the quadrant in a vertical poſition, and apply the eye to the back vane: then if the reflected horizon coincides with that ſeen directly, the glaſs is adjuſted; if they do not coincide, the ſcrew in the middle of the lever on the other ſide of the quadrant muſt be releaſed, and the nut at its extremity turned till both horizons coincide. It may be obſerved, that the reflected horizon will be inverted; that is, the ſea will be apparently uppermoſt and the ſky lowermoſt.

As this method of adjuſtment is eſteemed troubleſome, and is often found to be very difficult to perform at ſea, various contrivances have therefore been propoſed to render this adjuſtment more ſimple. Some of theſe are the following.

1. Mr Dollond's method of adjuſting the back horizon-glaſs.

In this method an index is applied to the back horizon-glaſs, by which it may be moved ſo as to be parallel to the index-glaſs, when *o* on the vernier coincides with *o* on the limb. When this is effected, the index of the back horizon-glaſs is to be moved exactly 90° from its former poſition, which is known by means of a divided arch for that purpoſe; and then the plane of the back horizon-glaſs will be perpendicular to the plane of the index-glaſs produced.

2. Mr Blair's method of adjuſting the back horizon-glaſs.

All that is required in this method is to poliſh the lower edge of the index-glaſs, and expoſe it to view. The back horizon-glaſs is adjuſted by means of a reflection from this poliſhed edge, in the very ſame method as the fore horizon-glaſs is adjuſted by the common method.

Plate CCCXLII.

In order to illuſtrate this, let R I H E (fig. 68.) repreſent a pencil of rays emitted from the object R, incident on the index-glaſs I, from which it is reflected to the fore horizon-glaſs H, and thence to the eye at E. By this double reflection, an image of the object is formed at *r*. RHE repreſents another pencil from the ſame object R, coming directly through the fore horizon-glaſs to the eye at E; ſo that the doubly reflected image *r* appears coincident with the object R itſelf, ſeen directly.

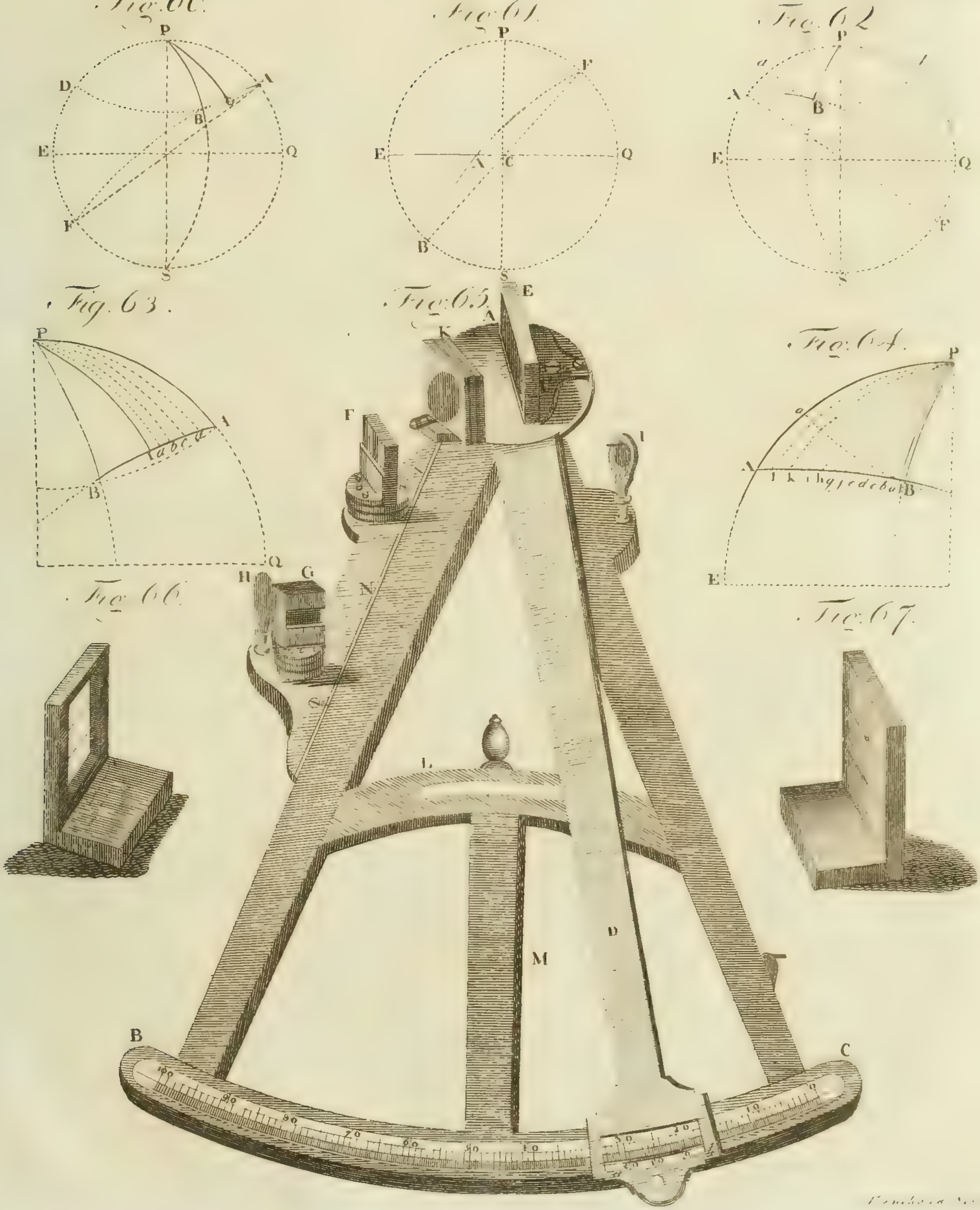
When this coincidence is perfect, and the object R ſo very diſtant as to make the angle IRH inſenſible, the poſition of the ſpeculums I and H will differ inſenſibly from paralleliſm; that is, the quadrant will be adjuſted for the fore-obſervation. Now it is from the eaſe and accuracy with which this adjuſtment can at any time be made, that the fore-obſervation derives its ſuperiority over the back-obſervation. But by grinding the edge of the index glaſs perpendicular to its reflecting ſurface, and poliſhing it, the back-obſervation is rendered capable of an adjuſtment equally eaſy and accurate as the fore horizon-glaſs; for by a pencil of rays emitted from the object S, incident on the reflecting edge of the index-glaſs D, thence reflected to the back horizon-glaſs B, and from that to the eye at *e*, an image will be formed at *s*; which image being made to coincide with the object S itſelf, ſeen directly, aſcertains the poſition of the back horizon glaſs relative to the index-glaſs with the ſame preciſion, and in a manner equally direct, as the former operation does that of the fore horizon-glaſs.

Directions for adjuſting the Back Horizon-Glaſs.

The method of adjuſting the quadrant for the back-obſervation

NAVIGATION.

Plate CCCXLI



[illegible] Sculp.

obſervation is this. If it is to be done without making uſe of the teleſcope, place the index at *o*, and, applying the eye to the hole in the ſight vane (K), or tube for directing the ſight, direct it through the back horizon-glaſs to the horizon, if that is the object to be uſed for adjuſting. The two horizons are then to be made to coincide, holding the quadrant firſt in a vertical and then in an horizontal poſition; by which means both adjuſtments will be effected as in the fore-obſervation.

There will be no difficulty in finding the reflected horizon, if the obſerver firſt directs his eye to that part of the horizon-glaſs where he obſerves the image of the poliſhed edge of the index-glaſs, which will appear double. When the directed horizon is made to appear in this ſpace, the reflected one will be ſeen cloſe by it, unleſs the inſtrument wants a great adjuſtment. In this caſe, a little motion of the back horizon-glaſs backwards and forwards will preſently bring it in view.

When the horizon, or any obſcure terreſtrial object, is to be made uſe of for adjuſting by means of the reflecting edge, there is a precaution to be taken, without which the obſerver will ſometimes meet with what will appear an unaccountable difficulty; for if the ſky, or other object behind him, ſhould happen to be pretty bright, he will not be able to diſcern the horizon at all. This ariſes from the image of the object behind him, which is reflected from the ſilvered ſurface of the index-glaſs, appearing to coincide with the horizon; in which caſe, the bright picture of the former, which is formed in the bottom of the eye, prevents the fainter impreſſion of the latter from being perceived. This will be avoided, either by applying a black ſcreen over the ſilvered ſurface of the index-glaſs, or, without being at this trouble, by ſtanding at a door or window, ſo that only the dark objects within can be reflected from the index-glaſs: but if the obſervation is to be made in the open air, a hat, or any ſuch dark obſtacle, held before the ſilvered ſurface of the index-glaſs, will very effectually remove this inconvenience.

It may be remarked, that ſome obſervers, inſtead of making the principal adjuſtment, place the ſpeculums parallel, by moving the index without altering the poſition of the horizon-glaſs: and the difference between *o* on the vernier and *o* on the limb is the index error, which muſt be ſubtracted from all angles meaſured by the back-obſervation, when *o* on the index is to the right of *o* on the limb; and added when to the left.

3. Mr Wright's method of adjuſting the back horizon-glaſs of his improved patent quadrant.

Plate CCCXLII.

Fig. 69. is a repreſentation of the quadrant complete in all its parts for uſe. A, is the reflecting ſurface of the index glaſs, which is made of the uſual length, and $\frac{9}{10}$ of an inch broad. The bottom part is covered in front by the braſs frame, and the reflecting ſurface is $\frac{7}{10}$ on the back. B, the fore horizon-glaſs, placed as uſual: O, the back horizon-glaſs, now placed under the fore-ſight vane on the firſt radius of the quadrant I: C, the ſight-vane of the fore-horizon-glaſs: D, the ſight-vane of the back horizon-glaſs: E, the coloured glaſſes in a braſs frame, in the proper place for the fore-obſervation: F, a hole in the frame to receive the coloured glaſſes when an obſervation is to be taken with the back horizon-glaſs in the common way, by turning the back to the ſun: G, a hole in the frame of the fartheſt radius K, to receive the coloured glaſſes when an obſervation is to be taken by the new method; which is by looking through the lower hole in the ſight-vane of the back horizon-glaſs, directly at the ſun in the line of ſight DN; the horizon from behind will then be reflected from the back of the index-glaſs to the horizon-glaſs, and from thence to the eye. (See fig. 73.) H, a braſs clamp on the upper end of the index, having a milled ſcrew underneath, which faſtens the round plate to the index when required. (See fig. 70.) IK, the graduated arch of the quadrant divided into 90 degrees: L, the braſs index which moves over the graduated arch: M, the vernier to ſubdivide the diviſions on the arch into ſingle minutes of a degree.

Fig. 70. ſhows the upper part of the index L on a larger ſcale, with part of the braſs frame that faſtens the index-glaſs, and the three adjuſting ſcrews D to adjuſt its axis vertical to the plane of the quadrant: B, the centre on which the milled plate O moves over the index: The dotted line BF is the diſtance it is required to move: K, the adjuſting ſcrew to ſtop it in its proper place for adjuſting the back obſervation-glaſs: G, a piece of braſs faſtened to the index oppoſite to the clamp H, to keep the plate O always cloſe to the index L.

Fig. 71. repreſents the parallel poſition of the index and horizon-glaſſes after adjuſtment by the ſun: BC, a ray from the ſun incident on the index-glaſs C, and from thence reflected to the fore horizon-glaſs D, and again to the eye at E, in the line DE, where the eye ſees the ſun at A by direct viſion, and the image by reflection in one; the parallel lines AE and BC being ſo near to each other, that no apparent angle can be obſerved in the planes of the index and horizon-glaſs, when adjuſted by a diſtant object.

In fig. 72. the index-glaſs is removed 45 degrees from the plane of the fore horizon-glaſs, and fixed in its proper place for adjuſting the back horizon-glaſs parallel to its plane, in the ſame manner as the fore horizon-glaſs is adjuſted.

In fig. 73. the index-glaſs (after the adjuſtment of the fore and back horizon-glaſſes) is carried forward by the index on the arch 90 degrees, and makes an angle of 45° with the plane of the fore horizon-glaſs, and is at right angles to the plane of the back horizon-glaſs. The eye at E now ſees the ſun in the horizon at H, reflected by the index and horizon-glaſſes from the zenith at Z, the image and object being 90 degrees

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(K) Beſides the hole in the ſight vane commonly made, there muſt be another nearer to the horizon-glaſs, and ſo placed that an eye directed through it to the centre of the horizon-glaſs ſhall there perceive the image of the poliſhed edge of the index-glaſs. This hole muſt not be made ſmall like the other, but equal to the ordinary ſize of the pupil of the eye, there being on ſome occaſions no light to ſpare.

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degrees diſtant. The back horizon K is now reflected from the back ſurface of the index-glaſs C to the horizon glaſs M, and from thence to the eye at D, in a right line with the fore horizon F. In order to make an exact contact of the fore and back horizons at F, the index muſt be advanced beyond the 90th degree on the arch, by a quantity equal to twice the dip of the horizon.

The quadrant is adjuſted for the fore-obſervation as uſual, having previouſly fixed the index-glaſs in its proper place by the milled ſcrew at H, as repreſented in fig. 70.

To adjuſt the Quadrant for the Back-obſervation.

Plate CCCXLII.

Faſten the index to 90° on the limb; looſen the ſcrew H (fig. 70.), and turn the plate O by the milled edge until the end of the adjuſting ſcrew K touch the edge of the clamp M; and by means of a diſtant object obſerve if the glaſſes are then parallel, as at fig. 71.: if they are, faſten the ſcrew H; if not, with a ſcrew-driver turn the ſcrew K gently to the right or left to make them perfect, and then faſten the ſcrew. Now remove the index back to O on the limb, and the index-glaſs will be parallel to the back horizon-glaſs E, fig. 72.: If not, make them ſo by turning the adjuſting ſcrew of the glaſs E, the eye being at the upper hole in the ſight-vane D, and the ſight directed to the horizon, or any diſtant object in the direction DN (fig. 69.) Now the index remaining in this poſition, the index-glaſs is to be returned, to ſtop at the pin E, and it will be parallel to the fore horizon-glaſs as at firſt: then the quadrant will be adjuſted for both methods of obſervation.

To obſerve the Sun's Altitude by the Back-obſervation.

Remove the coloured glaſſes to G (fig. 69.), and look through the lower hole in the ſight-vane D, in the line of direction DN, directly to the ſun, and move the index forward on the arch exactly in the ſame manner as in the fore-obſervation: make the contact of the ſun's limb and the back horizon exact, and the degrees and minutes ſhown by the index on the limb is the ſun's zenith diſtance. It may be obſerved, that the horizon will be inverted. If the ſun's lower limb be obſerved, the ſemidiameter is to be ſubtracted from the zenith diſtance; but if the upper limb is obſerved, the ſemidiameter is to be added.

The obſervation may be made in the uſual manner, by turning the back to the ſun. In this caſe the coloured glaſſes are to be ſhifted to F, and proceed according to the directions formerly given.

Uſe of Hadley's Quadrant.

The altitude of any object is determined by the poſition of the index on the limb, when by reflection that object appears to be in contact with the horizon.

If the object whoſe altitude is to be obſerved be the ſun, and if ſo bright that its image may be ſeen in the tranſparent part of the fore horizon-glaſs, the eye is to be applied to the upper hole in the ſight-vane; otherwiſe, to the lower hole: and in this caſe, the quadrant is to be held ſo that the ſun may be biſected by the line of ſeparation of the ſilvered and tranſparent parts of the glaſs. The moon is to be kept as nearly as poſſible in the ſame poſition; and the image of the ſtar is to be obſerved in the ſilvered part of the glaſs adjacent to the line of ſeparation of the two parts.

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There are two different methods of taking obſervations with the quadrant. In the firſt of theſe the face of the obſerver is directed towards that part of the horizon immediately under the ſun, and is therefore called the *fore obſervation*. In the other method, the obſerver's back is to the ſun, and it is hence called the *back obſervation*. This laſt method of obſervation is to be uſed only when the horizon under the ſun is obſcured, or rendered indiſtinct by fog or any other impediment.

In taking the ſun's altitude, whether by the fore or back obſervation, the obſerver muſt turn the quadrant about upon the axis of viſion, and at the ſame time turn himſelf about upon his heel, ſo as to keep the ſun always in that part of the horizon-glaſs which is at the ſame diſtance as the eye from the plane of the quadrant. In this way the reflected ſun will deſcribe an arch of a parallel circle round the true ſun, whoſe convex ſide will be downwards in the fore-obſervation and upwards in the back; and conſequently, when by moving the index, the loweſt point of the arch in the fore-obſervation, or higheſt in the back, is made to touch the horizon, the quadrant will ſtand in a vertical plane; and the altitude above the viſible horizon will be properly obſerved. The reaſon of theſe operations may be thus explained: The image of the ſun being always kept in the axis of viſion, the index will always ſhow on the quadrant the diſtance between the ſun and any object ſeen directly which its image appears to touch; therefore, as long as the index remains unmoved, the image of the ſun will deſcribe an arch everywhere equidiſtant from the ſun in the heavens, and conſequently a parallel circle about the ſun, as a pole. Such a tranſlation of the ſun's image can only be produced by the quadrant's being turned about upon a line drawn from the eye to the ſun, as an axis. A motion of rotation upon this line may be reſolved into two, one upon the axis of viſion, and the other upon a line on the quadrant perpendicular to the axis of viſion; and conſequently a proper combination of theſe two motions will keep the image of the ſun conſtantly in the axis of viſion, and cauſe both jointly to run over a parallel circle about the ſun in the heavens: but when the quadrant is vertical, a line thereon perpendicular to the axis of viſion becomes a vertical axis; and as a ſmall motion of the quadrant is all that is wanted, it will never differ much in practice from a vertical axis. The obſerver is directed to perform two motions rather than the ſingle one equivalent to them on a line drawn from the eye to the ſun; becauſe we are not capable, while looking towards the horizon, of judging how to turn the quadrant about upon the elevated line going to the ſun as an axis, by any other means than by combining the two motions abovementioned, ſo as to keep the ſun's image always in the proper part of the horizon-glaſs. When the ſun is near the horizon, the line going from the eye to the ſun will not be far removed from the axis of viſion; and conſequently the principal motion of the quadrant will be performed on the axis of viſion, and the part of motion made on the vertical axis will be but ſmall. On the contrary, when the ſun is near the zenith, the line going to the ſun is not far removed from a vertical line, and conſe-

Fig 68

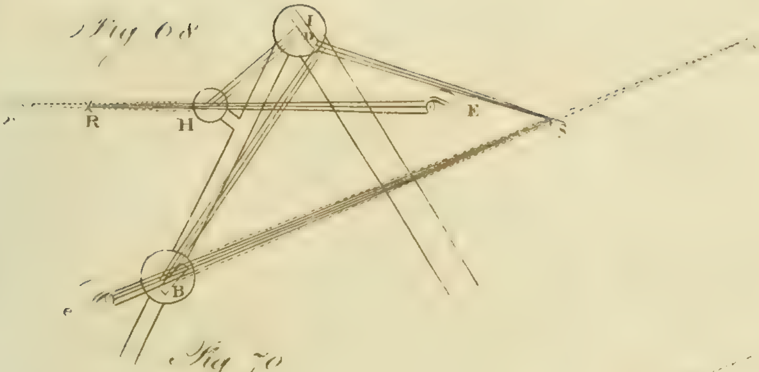


Fig 69

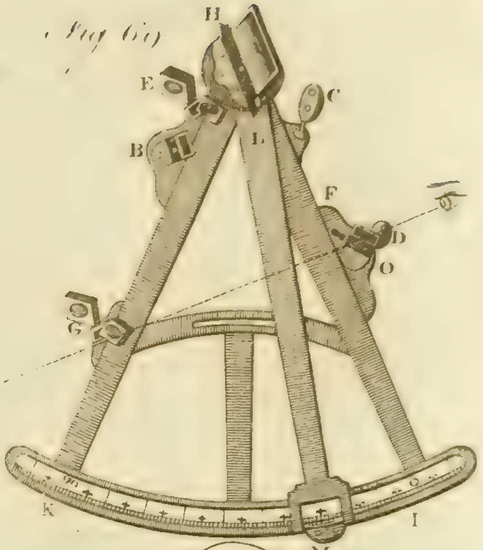


Fig 70

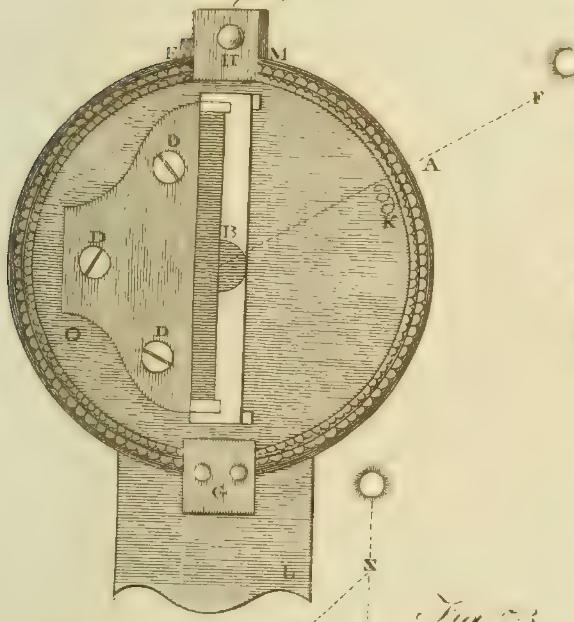


Fig 71

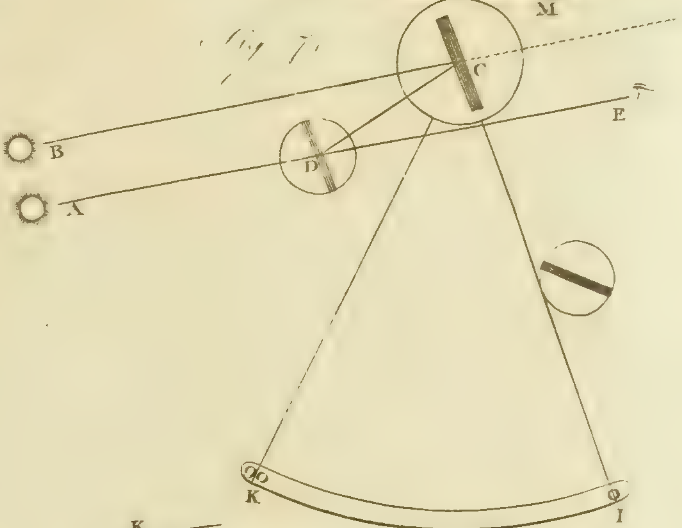


Fig 73

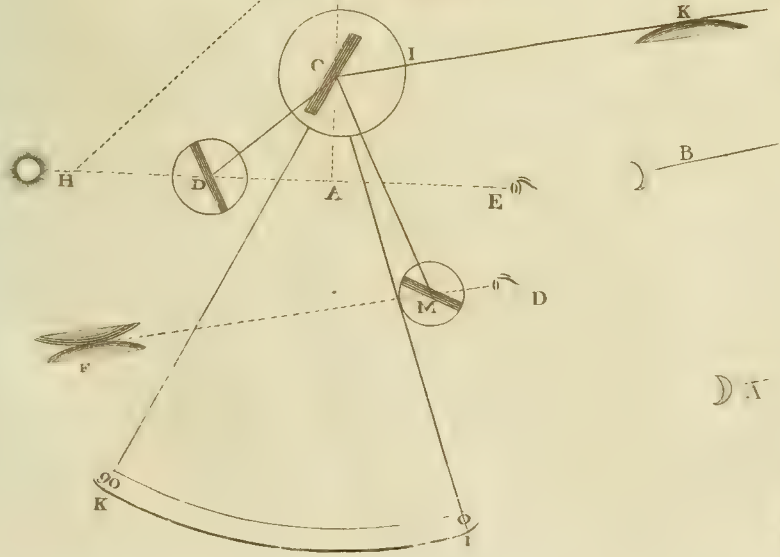
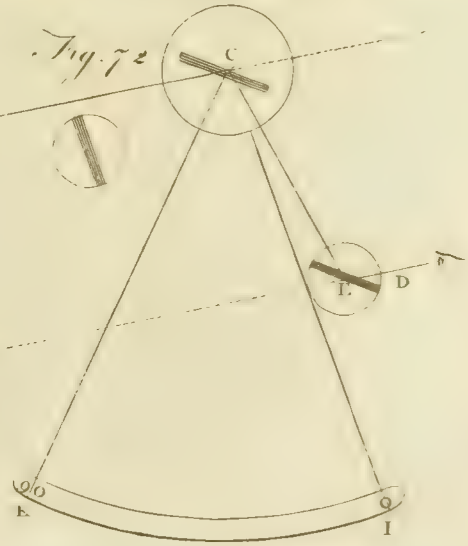


Fig 72



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quently the principal motion of the quadrant will be performed on a vertical axis, by the obſerver's turning himſelf about, and the part of the motion made on the axis of viſion will be but ſmall. In intermediate altitudes of the ſun, the motions of the quadrant on the axis of viſion, and on the vertical axis, will be more equally divided.

Obſervations taken with the quadrant are liable to errors, ariſing from the bending and elaſticity of the index, and the reſiſtance it meets with in turning round its centre: whence the extremity of the index, on being puſhed along the arch, will ſenſibly advance before the index-glaſs begins to move, and may be ſeen to recoil when the force acting on it is removed. Mr Hadley ſeems to have been apprehenſive that his inſtrument would be liable to errors from this cauſe; and in order to avoid them, gives particular directions that the index be made broad at the end next the centre, and that the centre, or axis itſelf, have as eaſy a motion as is conſiſtent with ſteadineſs; that is, an entire freedom from looſeneſs, or *ſhake*, as the workmen term it. By ſtrictly complying with theſe directions the error in queſtion may indeed be greatly diminiſhed; ſo far, perhaps, as to render it nearly inſenſible, where the index is made ſtrong, and the proper medium between the two extremes of a ſhake at the centre on one hand, and too much ſtiffneſs there on the other, is nicely hit; but it cannot be entirely corrected. For to more or leſs of bending the index will always be ſubject; and ſome degree of reſiſtance will remain at the centre, unleſs the friction there could be totally removed, which is impoſſible.

Of the reality of the error to which he is liable from this cauſe, the obſerver, if he is provided with a quadrant furniſhed with a ſcrew for moving the index gradually, may thus ſatisfy himſelf. After finiſhing the obſervation, lay the quadrant on a table, and note the angle; then cautiouſly looſen the ſcrew which faſtens the index, and it will immediately, if the quadrant is not remarkably well conſtructed, be ſeen to ſtart from its former ſituation, more or leſs according to the perfection of the joint and the ſtrength of the index. This ſtarting, which is owing to the index recoiling after being releaſed from the confined ſtate it was in during the obſervation will ſometimes amount to ſeveral minutes; and its direction will be oppoſite to that in which the index was moved by the ſcrew at the time of finiſhing the obſervation. But how far it affects the truth of the obſervation, depends on the manner in which the index was moved in ſetting it to *o*, for adjuſting the inſtrument; or in finiſhing the obſervations neceſſary for finding the index error.

The eaſieſt and beſt rule to avoid these errors ſeems to be this: In all obſervations made by Hadley's quadrant, let the obſerver take notice conſtantly to finiſh his obſervations, by moving the index in the ſame direction which was uſed in ſetting it to *o* for adjuſting; or in the obſervations neceſſary for finding the index error. If this rule is obſerved, the error ariſing from the ſpring of the index will be obviated. For as the index was bent the ſame way, and in the ſame degree in adjuſting as in obſerving, the truth of the obſervations will not be affected by this bending.

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To take Altitudes by the Fore-obſervation.

I. *Of the Sun.*

Turn down either of the coloured glaſſes before the horizon-glaſs, according to the brightneſs of the ſun; direct the ſight to that part of the horizon which is under the ſun, and move the index until the coloured image of the ſun appears in the horizon-glaſs; then give the quadrant a ſlow vibratory motion about the axis of viſion; move the index until the lower or upper limb of the ſun is in contact with the horizon, at the loweſt part of the arch deſcribed by this motion; and the degrees and minutes ſhown by the index on the limb will be the altitude of the ſun.

II. *Of the Moon.*

Put the index to *o*, turn down the green glaſs, place the eye at the lower hole in the ſight-vane, and obſerve the moon in the ſilvered part of the horizon-glaſs; move the index gradually, and follow the moon's reflected image until the enlightened limb is in contact with the horizon, at the lower part of the arch deſcribed by the vibratory motion as before, and the index will ſhow the altitude of the obſerved limb of the moon. If the obſervation is made in the daytime, the coloured glaſs is unneceſſary.

III. *Of a Star or Planet.*

The index being put to *o*. direct the ſight to the ſtar through the lower hole in the ſight-vane and tranſparent part of the horizon-glaſs; move the plane of the quadrant a very little to the left, and the image of the ſtar will be ſeen in the ſilvered part of the glaſs. Now move the index, and the image of the ſtar will appear to deſcend; continue moving the index gradually until the ſtar is in contact with the horizon at the loweſt part of the arch deſcribed; and the degrees and minutes ſhown by the index on the limb will be the altitude of the ſtar.

To take Altitudes by the Back-obſervation.

I. *Of the Sun.*

Put the ſtem of the coloured glaſſes into the perforation between the horizon-glaſſes, turn down either according to the brightneſs of the ſun, and hold the quadrant vertically; then direct the ſight through the hole in the back ſight-vane, and the tranſparent ſlit in the horizon glaſs to that part of the horizon which is oppoſite to the ſun; now move the index till the ſun is in the ſilvered part of the glaſs, and by giving the quadrant a vibratory motion, the axis of which is that of viſion, the image of the ſun will deſcribe an arch whoſe convex ſide is upwards; bring the limb of the ſun, when in the upper part of this arch, in contact with the horizon; and the index will ſhow the altitude of the other limb of the ſun.

II. *Of the Moon.*

The altitude of the moon is obſerved in the ſame manner as that of the ſun, with this difference only, that the uſe of the coloured glaſs is unneceſſary unleſs the moon is very bright; and that the enlightened limb,

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whether it be the upper or lower, is to be brought in contact with the horizon.

III. *Of a Star or Planet.*

Look directly to the star through the vane and transparent slit in the horizon glass, move the index until the opposite horizon, which is seen in the silvered part of the glass; and make the contact perfect as formerly. If the altitude of the star is known nearly, the index may be ſet to that altitude, the sight directed to the opposite horizon, and the observation made as before.

SECT. II. *Of finding the Latitude of a Place.*

The obſervations neceſſary for determining the latitude of a place, are either the meridian altitude of some known celeſtial object; or two altitudes when the object is out of the meridian. The latitude is deduced with more certainty and with leſs trouble from the firſt of theſe methods, than from the ſecond; and the ſun, for various reaſons, is the object moſt proper for this purpoſe at ſea. It, however, frequently happens, that by the interpoſition of clouds, the ſun is obſcured at noon; and by this means the meridian altitude is loſt. In this caſe, therefore, the method by double altitudes becomes neceſſary. The latitude may be deduced from three altitudes of an unknown object, or from double altitudes, the apparent times of obſervation being given.

The altitude of the limb of an object obſerved at ſea, requires four ſeparate corrections in order to obtain the true altitude of its centre: theſe are for *ſemidiameter, dip, refraction,* and *parallax.* (See ASTRONOMY, and the reſpective articles). The firſt and laſt of theſe corrections vaniſh when the obſerved object is a fixed ſtar.

When the altitude of the lower limb of any object is obſerved, its ſemidiameter is to be added thereto in order to obtain the central altitude; but if the upper limb be obſerved, the ſemidiameter is to be ſubtracted. If the altitude be taken by the back obſervation, the contrary rule is to be applied. The dip is to be ſubtracted from, or added to, the obſerved altitude, according as the fore or back obſervation is uſed. The refraction is always to be ſubtracted from, and the parallax added to, the obſerved altitude.

PROB. I. To reduce the ſun's declination to any given meridian.

RULE. Find the number in Table IX. anſwering to the longitude in the table neareſt to that given, and to the given day of the month. Now, if the longitude is weſt, and the declination increaſing, that is, from the 20th of March to the 22d of June, and from the 22d of September to the 22d of December, the above number is to be added to the declination: during the other part of the year, or while the declination is decreaſing, this number is to be ſubtracted. In eaſt longitude, the contrary rule is to be applied.

EXAMPLE I. Required the ſun's declination at noon 15th April 1793, in longitude 84° W?

Sun's declination at noon at Greenwich	10° 1'.8 N
Equation from Table IX. -	+ 5.0
Reduced declination - -	10 6.8 N

EXAMPLE II. Required the ſun's declination at noon [illegible] 1793, in longitude 15[illegible]° E?

Sun's declination at noon at Greenwich	[illegible]
Equation from table - -	— [illegible]
Reduced declination -	[illegible]

Method of finding the Latitude [illegible]

PROB. II. Given the ſun's meridian altitude, to find the latitude of the place of obſervation.

RULE. The ſun's ſemidiameter is to be added to, or ſubtracted from, the obſerved altitude, according as the lower or upper limb is obſerved: the dip anſwering to the height from Table V. is to be ſubtracted if the fore obſervation is uſed; otherwiſe, it is to be added: and the refraction anſwering to the altitude from Table IV. is to be ſubtracted: hence the true altitude of the ſun's centre will be obtained. Call the altitude north or ſouth, according as the ſun is ſouth or north at the time of obſervation; which ſubtracted from 90°, will give the zenith diſtance of a contrary denomination.

Reduce the ſun's declination to the meridian of the place of obſervation, by Problem I.; then the ſum or difference of the zenith diſtance and declination, according as they are of the ſame or of a contrary denomination, will be the latitude of the place of obſervation, of the ſame name with the greater quantity.

EXAMPLE I. October 17th 1793, in longitude 32° E, the meridian altitude of the ſun's lower limb was 48° 53' S, height of the eye 18 feet. Required the latitude?

Obſ. alt. ſun's lower limb,	48° 53' S	Sun's dec. 17 Oct. at noon	9° 37' S
Semidiameter	+ 0 16	Equation Table IX.	— 2
Dip and refraction	— 0 5	Reduced declination	9 35 S
True alt. ſun's centre	49 4 S	Zenith diſtance	40 56 N
		Latitude	31 21 N

EXAMPLE II. November 16th 1793, in longitude 15[illegible]° W, the meridian altitude of the ſun's lower limb was 87° 37' N, height of the eye 10 feet. Required the latitude?

Obſ. alt. ſun's lower limb	87° 37' N	Sun's dec. at noon	18° 57' S
Semidiameter	+ 0 16	Equation table	+ 0 8 S
Dip and refraction	— 0 3	Reduced dec.	19 5 S
True alt. ſun's centre	87 50 N	Zenith diſtance	2 10 S
		Latitude	21 15 S

EXAMPLE III. December 19th 1793, being nearly under the meridian of Greenwich, the altitude of the ſun's upper limb at noon was 4° 30' S, height of the eye 20 feet. Required the latitude?

Obſerved altitude of the ſun's upper limb	4° 30' S
Sun's ſemidiameter - -	— 0 16
Dip and refraction - -	— 0 15
True altitude of the ſun's centre -	3 59 S
Zenith diſtance - -	86 1 N
Declination - - -	23 27 S
Latitude - - -	62 34 N

EXAMPLE

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EXAMPLE IV. August 23d 1793, in longitude 107 E, the meridian altitude of the sun's lower limb by the back observation was 61° 8' N, and the height of the eye 14 feet. Required the latitude?

Observed altitude sun's upper limb	-	61° 8' N
Sun's semidiameter	- -	—0 16
Dip	- - -	+0 3
Refraction	- - -	—0 1
True altitude of the sun's centre	-	60 55 N
Zenith distance	- -	29 5 S
Reduced declination	- -	11 [illegible] N
Latitude	- - -	1[illegible] 25 S

The dip in Table V. answers to an entirely open and unobstructed horizon. It, however, frequently happens, that the land is over the horizon at the time of observation, and the ship nearer to the land than the visible horizon would be if unconfined. In this case, the dip will be different from what it would otherwise have been, and is to be taken from Table VI. in which the height is expreſſed at the top, and the diſtance from the land in the ſide column in nautical miles.—Seamen, in general, can eſtimate the diſtance of any object from the ſhip with ſufficient exactneſs for this purpoſe, eſpecially when that diſtance is not greater than ſix miles, which is the greateſt diſtance of the viſible horizon from an obſerver on the deck of any ſhip.

PROB. III. Given the meridian altitude of a fixed ſtar, to find the latitude of the place of obſervation.

RULE. Correct the altitude of the ſtar by dip and refraction, and find the zenith diſtance of the ſtar as formerly; take the declination of the ſtar from Table XI. and reduce it to the time of obſervation. Now, the ſum or difference of the zenith diſtance and declination of the ſtar, according as they are of the ſame or of a contrary name, will be the latitude of the place of obſervation.

EXAMPLE I. December 1ſt 1793, the meridian altitude of Sirius was 59° 50' S, height of the eye 14 feet. Required the latitude?

Obſerved altitude of Sirius	-	59° 50' S
Dip and refraction	- -	—0 4
True altitude	- -	59 46 S
Zenith diſtance	- -	30 14 N
Declination	- -	16 27 S
Latitude	- -	13 47 N

EXAMPLE II. February 17th 1797, the meridian altitude of Procyon was 71° 15' N, the height of the eye 10 feet. Required the latitude?

Obſerved altitude of Procyon	-	71° 15' N
Dip and refraction	- -	—0 3
True altitude	- -	71 12 N
Zenith diſtance	- -	18 48 S
Declination	- -	5 45 N
Latitude	- - -	13 3 S

PROB. IV. Given the meridian altitude of a planet, to find the latitude of a place of obſervation.

RULE. Compute the true altitude of the planet as directed in the problem (which is ſufficiently correct for altitudes taken at ſea); take its declination from the Nautical Almanac, [illegible] and reduce it to the time [illegible] Greenwich; then the ſum or difference of the zenith diſtance and declination of the planet will be the latitude, as before.

[illegible]

EXAMPLE I. December 11th 1793, the meridian altitude of Venus was 68° 42' N, and height of the eye 17 feet. Required the latitude?

Obſerved altitude of Venus	-	68° [illegible]
Dip and refraction	- -	—0 4
True altitude	- - -	68 [illegible]
Zenith diſtance	- -	21 22 [illegible]
Declination	- - -	7 26 [illegible]
Latitude	- - -	1[illegible] [illegible]

EXAMPLE II. April 16th 1793, the meridian altitude of Jupiter was 81° 5' S, height of the eye [illegible] feet. Required the latitude?

Obſerved altitude of Jupiter	- -	81° 5
Dip	- - -	—0 [illegible]
True altitude	- -	81 2 [illegible]
Zenith diſtance	- -	[illegible]
Declination	- - -	1[illegible] [illegible]
Latitude	- - -	1[illegible] [illegible]

PROB. V. Given the meridian altitude of the moon, to find the latitude of the place of obſervation.

RULE. Take the number anſwering to the day, the longitude, and daily variation of the moon's paſſing the meridian; which being applied to the time of paſſage given in the Nautical Almanac, will give the time of the moon's paſſage over the meridian of the ſhip.

Reduce this time to the meridian of Greenwich; and by means of the Nautical Almanac find the moon's declination, horizontal parallax, and ſemidiameter, at the reduced time.

Apply the ſemidiameter and dip to the obſerved altitude of the limb, and the apparent altitude of the moon's centre will be obtained; to which add the correction anſwering to the apparent altitude and horizontal parallax ‡, and the ſum will be the true altitude of the moon's centre; which ſubtracted from 90°, the remainder is the zenith diſtance, and the ſum or difference of the zenith diſtance and declination, according as they are of the ſame or of a contrary name, will be the latitude of the place of obſervation.

[illegible] Mackay's Treatiſe on [illegible] Tab. XX.

‡ Ditto, [illegible]

EXAMPLE I. December 24th 1793, in longitude 30° W, the meridian altitude of the moon's lower limb was 81° 15' N, height of the eye 12 feet. Required the latitude?

Time of paſſ. over the mer. of Greenwich =		[illegible]
Equation Table XX.	- -	+ [illegible]
Time of paſſ. over mer. ſhip	- -	[illegible]
Longitude in time	-	2 [illegible]
Reduced time	- - -	1[illegible] 2[illegible]
Moon's dec. at midnight, Tab. IX.		[illegible] N
Eq. to time from midnight	-	—[illegible]
Reduced declination	- -	1[illegible] [illegible]9 N
Moon's hor. par.	- -	5[illegible]' 25

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Moon's ſemidiameter	15 6
Augmentation	+0 14
Aug. ſemidiameter	15 20
Obſerved altitude of the moon's lower limb	81° 15′ N
Semidiameter	+0 15
Dip	−0 3
Apparent altitude of the moon's centre	81 27 N
Correction	+0 8
True altitude of moon's centre,	81 35 N
Zenith diſtance	8 25 S
Declination	14 49 N
Latitude	6 42 N

Example II. October 17th 1793, in longitude 8° W, the altitude of the moon's upper limb was 40° 27′ S, and height of the eye 20 feet. Required the latitude?

Time of paſſ. over mer. Greenwich	= 10h 52′
Equation to long.	0 0
Time of paſſ. over mer. ſhip	10 52
Longitude in time	0 32
Reduced time	11 24
Moon's dec. at midnight	= 0° 3′ N
Eq. to time from midnight	−0 3
Reduced declination	0 0
Moon's hor. parallax	60 29″
Moon's ſemidiameter	16 29
Augmentation	+0 12
Aug. ſemidiameter	16 41
Obſerved altitude moon's lower limb	40° 27′ S
Semidiameter and dip	−0 21
Apparent altitude moon's centre	40 6
Correction	+0 45
True altitude moon's centre	40 51 S
Zenith diſtance	49 9 N
Declination	0 0
Latitude	49 9 N

Remark. If the object be on the meridian below the pole at the time of obſervation, then the ſum of the true altitude and the complement of the declination is the latitude, of the ſame name as the declination or altitude.

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Example I. July 1ſt 1793, in longitude 15° W, the altitude of the ſun's lower limb at midnight was 8° 58′, height of the eye 18 feet. Required the latitude?

Obſerved altitude ſun's lower limb	8° 58′
Semidiameter	+0 16
Dip and refraction	−0 10
True altitude of ſun's centre	9 4 N
Compl. declin. reduced to time and place	66 57 N
Latitude	76 1 N

Example II. December 1ſt 1798, the altitude of the pole ſtar below the pole was 52° 20 N, height of the eye 12 feet. Required the latitude?

Obſerved altitude, pole ſtar	52° 20′ N
Dip and refraction	−0 4
True altitude	52 16 N
Complement of declination	1 46
Latitude	54 2 N

Prob. VI. Given the latitude by account, the declination and two obſerved altitudes of the ſun, and the interval of time between them, to find the true latitude.

Rule. To the log. ſecant of the latitude by account, add the log. ſecant of the ſun's declination; the ſum, rejecting 20 from the index, is the *log. ratio*. To this add the log. of the difference of the natural ſines of the two altitudes, and the log. of the half elapſed time from its proper column.

Find this ſum in column of middle time, and take out the time anſwering thereto; the difference between which and the half elapſed time will be the time from noon when the greater altitude was obſerved.

Take the log. anſwering to this time from column of riſing, from which ſubtract the log. ratio, the remainder is the logarithm of a natural number; which being added to the natural ſine of the greater altitude, the ſum is the natural coſine of the meridian zenith diſtance; from which and the ſun's declination the latitude is obtained as formerly.

If the latitude thus found differs conſiderably from that by account, the operation is to be repeated, uſing the computed latitude in place of that by account (L).

Example I. June 4th 1795, in latitude by account

(L) This method is only an approximation, and ought to be uſed under certain reſtrictions; namely,

The obſervations muſt be taken between nine o'clock in the forenoon and three in the afternoon. If both obſervations be in the forenoon, or both in the afternoon, the interval muſt not be leſs than the diſtance of the time of obſervation of the greateſt altitude from noon. If one obſervation be in the forenoon and the other in the afternoon, the interval muſt not exceed fours hours and a half; and in all caſes, the nearer the greater altitude is to noon the better.

If the ſun's meridian zenith diſtance be leſs than the latitude, the limitations are ſtill more contracted. If the latitude be double the meridian zenith diſtance, the obſervations muſt be taken between half paſt nine in the morning and half paſt two in the afternoon, and the interval muſt not exceed three hours and an half. The obſervations muſt be taken ſtill nearer to noon, if the latitude exceeds the zenith diſtance in a greater proportion. See *Maſkelyne's Britiſh Mariner's Guide, and Requiſite Tables*, 2d. Ed.

count 37° N at 10h 29' A. M. per watch, the corrected altitude of the ſun was 65° 24', and at 12h 31', the altitude was 74° 8'. Required the true latitude?

Time per wat.	Alt.	N. Sines.		
			Lat. by acc. 37° 0' Secant	0,09765
10h 29'	65° 24'	90924	Declination 22 28 Secant	0,03428
12 31	74 8	96190	Logarithm ratio	0,13193
2 2	Differ.	5266	Logarithm	3,72148
1 1			Half elapſed time	0,57999
31 10"			Middle time -	4,43340
29 50			Riſing - -	2,97740
			Log. ratio	0,13193

Natural number		624	2.79547
Greateſt altitude	74° 8' N. ſine	96190	
Mer. zenith diſt.	14 30 N. coſine	96814	
Declination	22 28		
Latitude	36 58 N.		

Example II. October 17th 1793, in latitude 43° 24' N. by account, at 0h 38' P. M. the correct altitude of the ſun's centre was 36° 5', and at 2h 46' P. M. the altitude was 24° 49'. Required the latitude?

Times per wat.	Alt.	N. Sines.		
			Lat. by acc. 43° 24' Secant	0,13872
0h 38'	36° 5'	58896	Declination 9 32 Secant	0,00604
2 46	24 49	41972	Logarithm ratio	0,14476
2 8	Differ.	16924	Log.	4.22850
1 4			Half elapſed time	0.55066
1 41 30"			Middle time	4.93292
37 30			Riſing	3.12570
			Log. ratio	0,14476

Natural number		957	2,98094
Greateſt altitude	36° 5' N. ſine	58896	
Mer. zen. diſtance	53 14 N. coſine	59853	
Declination	9 32		
Latitude	43 42 N.		

Example III. Auguſt 25th 1793, in latitude 57° N by account, in the morning the altitude of the ſun's lower limb was 34° 22', and 1h 46 after the altitude of the lower limb was 42° 12½', the height of the eye 14 feet. Required the latitude?

Firſt altitude	34° 22	Second altitude	42° 12½
Sun's ſemidiameter	+0 16	Semidiameter	+0 16
Dip and refraction	—0 5	Dip and refract.	—0 4½
Corrected altitude	34 33	Corrected altit.	42 24

Interval of time.	Altit.	N. Sines.		
			Lat. by acc. 57° 0' Secant.	0,26389
	34° 33'	56713	Declination 10 33 Secant.	0,00741
	42 24	67430	Logarithm ratio	0,27130
1h 46'	Difference	10717	Log.	4,03007
53 0"			Half elapſed time	0,63978
1 43 30			Middle time	4,94115
50 30			Riſing	3,38343
			Log. ratio	0,27130

Natural number		1295	3,11213
Greateſt altitude	42° 24' N. ſine	67430	
Mer. zen. diſtance	46 35 N. coſine	68725	
Declination	10 33		
Latitude	57 8 N.		

The greateſt altitude was obſerved 50'½ before 12 or at 11h 9½; hence the firſt altitude was obſerved at 9h 23½ A. M.

Example IV. In latitude 49° 48' N. by account, the ſun's declination being 9° 37' S. at 0h 32' P. M. per watch, the altitude of the ſun's lower limb was 28° 32', and at 2h 41' it was 19° 25', the height of the eye 12 feet. Required the true latitude?

Firſt obſerved altit.	28° 32'	Second altitude	19° 25'
Semidiameter	+0 16	Semidiameter	+0 16
Dip and refraction	—0 5	Dip and refr.	—0 6
True altitude	28 43	True altitude	19 35

Time per wat.	Alt.	N. Sines.		
			Lat. by acc. 49° 48' Secant.	0,19013
0h 32'	28° 43'	48048	Declination 9 37 Secant.	0,00615
2 41	19 35	33518	Log. ratio -	0,19628
2 9	Difference	14530	Log. -	4,16227
1 4 30'			Half elapſed time	0,55637
1 37 0			Middle time	4,91492
32 30			Riſing	3,00164

Natural number		639	2,80536
Mer. zen. diſt.	60° 52 N. coſine	48687	
Declination	9 37 S.		
Latitude	51 15 N		

As the latitude by computation differs 1° 27' from that by account, the operation muſt be repeated.

Computed latitude	51° 15'	Secant	0.20348
Declination	9 37	Secant	0.00615
Logarithm ratio - -			0.20963
Difference of nat. ſines	14530	Log.	4.16227
Half elapſed time	1h 4' 30"	Log.	0.55637
Middle time	1 40 20	Log.	4.92827
Riſing -	0 35 50	Log.	3.08630

Natural number		753	2.87667
Gr. altitude	28° 43' N. ſine	48048	
Mer. zen. diſt.	60 47 N. coſine	48801	
Declination	9 37		
Latitude	51 10 N.		

As this latitude differs only 5' from that uſed in the computation, it may therefore be depended on as the true latitude.

Prob. VII. Given the latitude by account, the ſun's declination, two obſerved altitudes, the elapſed time, and the courſe and diſtance run between the obſervations; to find the ſhip's latitude at the time of obſervation of the greater altitude.

Rule. Find the angle contained between the ſhip's courſe and the ſun's bearing at the time of obſervation of the leaſt altitude, with which enter the Traverſe Table as a courſe, and the difference of latitude anſwering to the diſtance made good will be the reduction of altitude.

Now, if the leaſt altitude be obſerved in the forenoon, the reduction of altitude is to be applied thereto by addition or ſubtraction, according as the angle between

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between the ſhip's courſe and the ſun's bearing is leſs or more than eight points. If the leaſt altitude be obſerved in the afternoon, the contrary rule is to be uſed.

The difference of longitude in time between the obſervations, is to be applied to the elapſed time by addition or ſubtraction, according as it is eaſt or weſt. This is, however, in many caſes ſo inconſiderable as to be neglected.

With the corrected altitudes and interval, the latitude by account and ſun's declination at the time of obſervation of the greateſt altitude, the computation is to be performed by the laſt problem.

Example I. July 6th 1793, in latitude 58° 14′ N. by account, and longitude 16° E. at 10h 54′ A. M. *per* watch, the altitude of the ſun's lower limb was 53° 17′, and at 1h 17′ P. M. the altitude was 52° 51′, and bearing *per* compaſs SWbW; the ſhip's courſe during the elapſed time was SW½W, and the hourly rate of ſailing 8 knots, the height of the eye 16 feet. Required the true latitude at the time of obſervation of the greater altitude?

Sun's bear. at 2d. ob. SWbW. Interval bet. obſerv. 2h 23′

Ship's courſe SW½W Dist. run = 2h 23 × 8 = 19 m.

Contained angle 3½ points.

Now to courſe 3½ points and diſtance 19 miles, the difference of latitude is 14.7 or 15 miles.

Firſt obſerved alt.	53° 17′	Second obſerved alt.	52° 51′
Semidiameter	+0 16	Semidiameter	+0 16
Dip and refract.	−0 4	Dip and refraction	−0 4
True altitude	53 29	Reduction	−0 15
		Reduced altitude	52 48

Time of ob. of gr. alt.	10h 54′ A. M.	Sun's dec.	22° 39′ N.
Longitude in time	1 4	Eq. to r. t.	+ 1
Reduced time	9 50 A. M.	Red. decl.	22 40 N.

Time per wat.	Alt.	N. Sines.	Lat. by acc. 58° 14′ Secant.	0,27863
10h 54′	53° 29	80368	Declination 22 40 Secant.	0,03491
1 17	52 48	79653	Logarithm ratio	0,31354
2 23	Difference	715	Log.	2,85431
1 11 30″			Half elapſed time	0,51294
5 30			Middle time	3,68079
1 6 0			Riſing	3,61469
			Log. ratio	0,31354
Natural number			2001	3,30115

Greateſt altitude 53° 29′ N. ſine 80368

Mer. zen. diſtance 34 33 N. coſine 82369

Declination 22 40 N.

Latitude 57 13 N.

Since the computed latitude differs ſo much from that by account, it will be neceſſary to repeat the operation.

Computed latitude	57° 13′ Secant	0.26643
Declination	22 40 Secant	0.03491
Logarithm ratio		0.30134

Difference of natural ſines	715	L[illegible]	[illegible]
Half elapſed time	1h 11′ 30″	L[illegible]	[illegible]
Middle time	5 20	L[illegible]	[illegible]
Riſing	1 6 10	L[illegible]	[illegible]
Logarithm ratio	-	-	[illegible]
Natural number		2068	[illegible]
Greateſt altitude 53° 29′ N. ſine		80368	

Mer. zen. diſt. 34 29 N. coſine 82436

Declination 22 40 N.

Latitude 57 9 N.

As this latitude differs only 4 miles from that uſed in the computation, it may therefore be depended on as the true latitude.

Example II. Sept. 13th 1793, in latitude 38° 14′ N by account, and longitude 14° E. at 9h 28′ A. M. *per* watch, the altitude of the ſun's lower limb was 40° 42′, and azimuth *per* compaſs SE½E, at 11h 16′ A. M. the altitude was 53° 11′; the ſhip's courſe during the elapſed time was W½N at the rate of 9 knots an hour, and height of the eye 12 feet. Required the true latitude at the time of the ſecond obſervation?

Sun's bear. at firſt obſ. SE½E. Elapſe time 1h. 48′

Ship's courſe, W½N D. run = 1h 48 × 9 = 16 m

Contained angle 11½ points; ſupplement 4½ pts.

To courſe 4½ points, and diſtance run 16 miles, the difference of latitude is 10.7, or 11 miles.

Firſt obſerved alt.	40° 42′	Second obſ. alt.	53° 11
Sun's ſemidiameter	+0 16′	Semidiameter	+0 16
Dip and refraction	−0 4	Dip and refr.	−0 4
Reduction of alt.	−0 11	Corrected alt.	53 23
Reduced altitude,	40 43		

Time of ob. great. alt.	11h 16	Sun's dec. at noon	3° 32′
Longitude in time,	0 56	Eq. to time from n. n.	+ 1⅗
Reduced time,	10 20	Reduced declin.	4 34

Time per Watch.	Alt.	N. Sines.	Lat. by acc. 38° 14′ Secant	0,10466
9h 28′	40° 43	65232	Declination 3 34 Secant	0,00084
11 16	53 23	80264	Logarithm ratio	0,10550
1 48	Differ.	15032	Log. - -	4,17702
0 54			Half elapſed time -	0,63181
1 37			Middle time -	4,91333
0 43			Riſing - -	3,24427
Natural number		1376		3,13877

Mer. Zen. diſt.	35° 16 N. coſine 81640		
Declination	3 34	Secant	0,00084
Latitude	38 50	Secant	0,10848

Logarithm ratio	- -		0,10932
Difference of natural ſines	15032	Log	4,17702
Half elapſed time	0h 54′ 0″	Log	0,63181
Middle time -	1 37 50	Log	4,91815
Riſing -	0 43 10	Log.	3,26029
Natural number -	14[illegible]8		3,15157

Greateſt

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Greateſt altitude	53° 23′ N.	ſine	80264
Mer. Zen. diſt.	35 14 N	coſine	81682
Declination	3 34		
Latitude -	38 48 N.		

This latitude differing only 2 miles from that uſed in the computation, may therefore be relied on as the true latitude.

Remark. If the ſun comes very near the zenith, the ſines of the altitude will vary ſo little as to make it uncertain which ought to be taken as that belonging to the natural ſine of the meridian altitude. In this caſe, the following method will be found preferable.

To the log. riſing of the time from noon found as before, add the log. ſecant of half the ſum of the eſtimate meridian altitude, and greateſt obſerved altitude; from which ſubtract the log. ratio, its index being increaſed by 10, and the remainder will be the log. ſine of an arch; which added to the greateſt altitude will give the ſun's meridian altitude.

Example. December 21ſt 1793, in latitude 22° 40′ S, by account, at 11h 57 the correct altitude of the ſun's centre was 89° 10′, and at 12h 4′ 40″, the altitude was 88° 50′. Required the true latitude?

Times per Wat.	Alt.	N. Sines.		
			Lat. by acc. 22° 40 Sec.	0,03491
11h. 57′ 0″	89° 10′	99980	Declination 23 28 Sec.	0,03749
12 4 40	88 50	99970	Logarithm ratio	0,07240
0 7 40		Difference 10	log.	1,00000
0 3 50			Half elapſed time	1,77663
0 0 50			Middle time	2,84903
0 3 0			Riſing	0,93284

Comp. of lat. by acc.	67° 20′		
Declination	23 28		
Sum	90 48		
Eſtimate mer. altitude	89 12	89° 11 ſec.	11.84609
Greateſt altitude	89 10		
			12.77893
Logarithm ratio + 5			5.07240
Arch	0 17′	ſine	7.70653
Greateſt altitude	89 10		
Meridian altitude	89 27	zen. diſt.	0 33 N
		declination	23 28 S
		latitude	22 55 S

This differing from the aſſumed latitude, the work muſt be repeated.

Latitude	22° 55′	ſecant	0.03571
Declination	23 28	ſecant	0.03749
Logarithm ratio			0.07320
Difference of natural ſines,	10	log.	1.00000
Half elapſed time	3′ 50		1.77663
Middle time	0 50		2.84983
Riſing	3 0		0.93284
Comp. of lat.	67° 5′		
Declination	23 28		
Sum	90 33		
Mer. alt.	89 27	89° 18½ ſec.	11.91827
Greateſt alt.	89 10		
			12.85111
Log. ratio + 5			5.07320
Arch	0 21		7.77791
Greateſt altitude	89 10		
Merid. altitude	89 31	zen. diſt.	0° 29′
		Declination	23 28
		Latitude	22 59 S

If the work be repeated with this laſt latitude, the latter part only may be altered.

Latitude	22° 59′	ſecant	0.03592
Declination	23 28	ſecant	0.03749
Eſt. mer. alt.	89 31	log. ratio	0.07341
Greateſt altitude	89 10	ar. com.—5	4.92659
Sum	178 41		
Half	89 20½	ſecant	1.93972
Riſing			0.93284
Arch	0 22	ſine	7.79915
Greateſt altitude	89 10		
Meridian altitude	89 32		
Zenith diſtance	0 28		
Declination	23 28		
Latitude	23 0 S.		

Prob. VIII. To find the latitude from double altitudes of the ſun and the elapſed time: one of theſe obſervations being taken near the eaſt or weſt points, and the other near the meridian.

Rule. With the latitude by account, the ſun's declination and leaſt altitude, compute the apparent time of obſervation by Problem VII. of next chapter. From whence and the interval of time between the obſervations, the time from noon when the greateſt altitude was obſerved will be known. To the logarithmic riſing of which, add the logarithmic coſines of the ſun's declination and the latitude of the place by account; the ſum will be the logarithm of a natural number, which added to the natural ſine of the greater altitude, will give the natural coſine of the meridian zenith diſtance; and hence the latitude is found as formerly.

Or the time from noon being found, the latitude may be computed by the rule given in the preceding remark.

Example. September 1ſt 1793, in latitude 40° 0′ N by account, at 6h 5′ A. M. per watch, the altitude of the ſun's lower limb was 16° 21′, and at 11h 4[illegible] the altitude was 57° 42′; the height of the eye 18 feet. Required the latitude?

Firſt alt.	16° 21′	Second alt.	57 42′
Sun's ſemidia.	+0 16	Sun's ſemidia.	+0 16
Dip and refr.	—0 7	Dip and refrac.	—0 5
True altitude	16 30	True altitude	57 53

Lat.

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Lat. by acc.	40 0 N	Secant		0.11575
Declination	8 3 N	Secant		0.00430
Difference	31 57	nat. cofine	84851	
Altitude	16 30	nat. fine	28402	
		Difference	56449	4.75165
Time from noon of firft obf	5h 0' 40"	rifing		4.87170
Interval of time between obf.	4 45 0			
Time from noon of 2d obf.	0 15 40	rifing		2.36839
Latitude by acc.	40° 0'	cofine		9.88425
Declination	8 3	cofine		9.99670
Natural number			178	2.24934
Greater altitude	57 53	nat. fine	84697	
Merid. zen. dift.	31 55	nat. cofine	84875	
Declination	8 3			
Latitude	39 58 N.			

Prob. IX. Given the altitudes of two known ftars, obferved at the fame or at different times: and if at different times, the interval between the obfervations; to find the latitude.

Rule. If both altitudes be obferved at the fame time, call the difference between their right afcenfions the reduced interval.

But if the altitudes be taken at different times, reduce the interval between the obfervations to fidereal time, by adding thereto the proportional part anfwering to the interval, and 3' 56", the daily acceleration of the fixed ftars. Now to the right afcenfion of the firft obferved ftar, add the interval in fidereal time, and the difference between this fum and the right afcenfion of the other ftar will be the reduced interval.

To the logarithm rifing of the reduced interval, add the logarithmic cofines of the ftars declinations: fubtract the natural number anfwering to the fum of thefe logarithms from the natural cofine of the difference or fum of the ftars declinations, according as they are of the fame or of a contrary name, and the remainder will be the natural fine of arch firft.

To the logarithmic cofine of arch firft add the logarithmic fecant of declination of the ftar having the leaft polar diftance, and the logarithm half elapfed time of the reduced interval, the fum will be the logarithm half elapfed time of arch fecond.

From the natural cofine of the difference between arch firft and the altitude of the ftar having the greateft polar diftance, fubtract the natural fine of the altitude of the other ftar, and find the logarithm of the remainder; to which add the logarithm fecant of arch firft, and the logarithmic fecant of the altitude of the ftar having the greateft polar diftance, the fum will be the logarithm rifing of arch third. The difference between arches fecond and third is arch fourth.

To the logarithm rifing of arch fourth add the logarithmic cofines of the declination and altitude of the ftar having the greateft polar diftance; fubtract the correfponding natural number from the natural cofine of the difference between the altitude and declination, the polar diftance being lefs than 90°; otherwife, from their fum, and the remainder will be the natural fine of the latitude.

Method of finding the Latitude and Longitude at sea.

Example I. January 1ft 1793, the true altitude of Capella was 69° 23, and at the fame inftant the true altitude of Sirius was 16° 19'. Required the latitude?

Right afcenfion of Capella	5h 1' 25"			
Right afcenfion of Sirius	6 36 1			
Interval	1 34 36			
Interval	1h 34' 36"	rifing		3.92270
Capella's declin.	45° 46' N	cofine		9.84160
Sirius's declin.	16 27 S	cofine		9.98185
Sum	62 13 N	cofine	46613	
			5599	3.74615
Arch firft	24 13 N	fine	41014 cof.	9.96000
Capella's declin.	45 46	fecant		0.15640
Interval	1h 34' 36"	H. E. time		0.39670
Arch fecond	1 11 28	H. E. time		0.51310
Arch firft	24 13	fecant		0.04000
Sirius's altitude	16 19	fecant		0.01785
Difference	7 54 N.	cofine	99051	
Capella's altitude	69 23 N	fine	93596	
			5455	3.73679
Arch third	1h 21' 20"	rifing		3.79464
Arch fecond	1 11 28			
Arch fourth	9 52	rifing		1.96708
Sirius's declin.	16 27	cofine		9.98185
altitude	16 19	cofine		9.98215
Sum	32 46 N	cof.	84088	
			85	1.93008
Latitude	57 9 N	fine	84003	

Example II. In north latitude, Decem. 30th 1793, the true altitude of Menkar was 43° 38'; and 1h 18' after the altitude of Rigel was 29° 51'. Required the latitude?

Obferved Interval	1h 18' 0"			
Equation	+ 0 0 13			
Inter. in fid. time	1 18 13			
Right af. of Menkar	2 52 31			
Sum	4 9 44			
Right afc. of Rigel	5 4 34			
Reduced interval	0 54 50	rifing		3.45462
Declin. of Menkar	3 16½ N	cofine		9.99929
Declin. of Rigel	8 27 S	cofine		9.99526
Sum	11 43½ N	co.	97913	
			2813	3.44917
Arch firft	71 59 N	fine	95100 co.	9.49037
Declin of Menkar	3 16½	fecant		0.00071
Reduced interval	0 54 50	H. E. time		0.62529
Arch fecond	3 19 36	H. E. time		0.11637

Arch

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Arch firſt	71° 59′	ſecant		0.50963
Altitude Rigel	29 51	ſecant		0.618.
Difference	42 8 N	coſine	74159	
Alt. of Menkar	43 38 N	ſine	69004	
Difference			5155	3.71223
Arch third	2h 24′ 27″	riſing		4.28367
Arch ſecond	3 19 36			
Arch fourth	0 55 9	riſing		3.45960
Declin. of Rigel	8 27 S	coſine		9.99526
Alt. of Rigel	29 51	coſine		9.93819
Sum	38 18 N	coſine	78473	
			2472	3.39305
Latitude	49 28 N	ſine	76006	

Chap. II. *Containing the Method of finding the Longitude at Sea by Lunar Obſervations.*

Sect. I. *Introduction.*

The obſervations neceſſary to determine the longitude by this method are, the diſtance between the ſun and moon, or the moon and a fixed ſtar near the ecliptic, together with the altitude of each. The ſtars uſed in the Nautical Almanac for this purpoſe are the following: *namely α Arietis*, *Aldebaran*, *Pollux*, *Regulus*, *Spica Virginis*, *Antares*, *α Aquilæ*, *Fomalhaut*, and *α Pegaſi;* and the diſtances of the moon's centre from the ſun, and from one or more of theſe ſtars, are contained in the viii. ix. x. and xi. pages of the month, at the beginning of every third hour apparent time, by the meridian of Greenwich. The diſtance between the moon and the ſun, or one of theſe ſtars, is obſerved with a ſextant; and the altitudes of the objects are taken as uſual with a Hadley's quadrant.

In the practice of this method, it will be found convenient to be provided with three aſſiſtants; two of theſe are to take the altitudes of the ſun and moon, or moon and ſtar, at the ſame time the principal obſerver is taking the diſtance between the objects; and the third aſſiſtant is to obſerve the time, and write down the obſervations. In order to obtain accuracy, it will be neceſſary to obſerve ſeveral diſtances, and the correſponding altitudes; the intervals of time between them being as ſhort as poſſible; and the ſum of each divided by the number will give the mean diſtance and mean altitudes; from which the time of obſervation at Greenwich is to be computed by the rules to be explained.

If the ſun or ſtar from which the moon's diſtance is obſerved be at a proper diſtance from the meridian, the time at the ſhip may be inferred from the altitude obſerved at the ſame time with the diſtance: in this caſe, the watch is not neceſſary; but if that object be near the meridian, the watch is abſolutely neceſſary, in order to connect the obſervations for aſcertaining the apparent time at the ſhip and the longitude with each other.

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An obſerver without any aſſiſtants may very eaſily take all the obſervations, by firſt taking the altitudes of the objects, then the diſtance, and again their altitudes, and reduce the altitudes to the time of obſervation of the diſtance; or, by a ſingle obſervation of the diſtance, the apparent time being known, the longitude may be determined.

A ſet of obſervations of the diſtance between the moon and a ſtar, and their altitudes, may be taken with accuracy during the time of the evening or morning twilight; and the obſerver, though not much acquainted with the ſtars, will not find it difficult to diſtinguiſh the ſtar from which the moon's diſtance is to be obſerved. For the time of obſervation nearly, and the ſhip's longitude by account being known, the eſtimate time at Greenwich may be found; and by entering the Nautical Almanac with the reduced time, the diſtance between the moon and given ſtar will be found nearly. Now ſet the index of the ſextant to this diſtance, and hold the plane of the inſtrument ſo as to be nearly at right angles to the line joining the moon's cuſps, direct the ſight to the moon, and by giving the ſextant a ſlow vibratory motion, the axis of which being that of viſion, the ſtar, which is uſually one of the brighteſt in that part of the heavens, will be ſeen in the ſilvered part of the horizon-glaſs.

Sect. II. *Of the Sextant.*

This inſtrument is conſtructed for the expreſs purpoſe of meaſuring with accuracy the angular diſtance between the ſun and moon, or between the moon and a fixed ſtar, in order to aſcertain the longitude of a place by lunar obſervations. It is, therefore, made with more care than the quadrant, and has ſome additional appendages that are wanting in that inſtrument.

Plate CCCXLIII.

Fig. 74 repreſents the ſextant, ſo framed as not to be liable to bend (m). The arch AA is divided into 120 degrees, each degree is divided into three parts; each of theſe parts therefore, contains 20 minutes, which are again ſubdivided by the vernier into every half minute or 30 ſeconds. The vernier is numbered at every fifth of the longer diviſions, from the right towards the left, with 5, 10, 15, and 20; the firſt diviſion to the right being the beginning of the ſcale.

In order to obſerve with accuracy, and make the images come preciſely in contact, an adjuſting ſcrew B is added to the index, which may thereby be moved with greater accuracy than it can be by hand; but this ſcrew does not act until the index is fixed by the finger ſcrew C. Care ſhould be taken not to force the adjuſting ſcrew when it arrives at either extremity of its adjuſtment. When the index is to be moved any conſiderable quantity, the ſcrew C at the back of the ſextant muſt be looſened; but when the index is brought nearly to the diviſion required, this back ſcrew ſhould be tightened, and then the index may be moved gradually by the adjuſting ſcrew.

(m) Troughton's patent double-framed ſextants are not liable to bend.

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There are four tinged glaſſes D, each of which is ſet in a ſeparate frame that turns on a centre. They are uſed to defend the eye from the brightneſs of the ſolar image and the glare of the moon, and may be uſed ſeparately or together as occaſion requires.

There are three more ſuch glaſſes placed behind the horizon-glaſs at E, to weaken the rays of the ſun or moon when they are viewed directly through the horizon-glaſs. The paler glaſs is ſometimes uſed in obſerving altitudes at ſea, to take off the ſtrong glare of the horizon.

The frame of the index-glaſs I, is firmly fixed by a ſtrong cock to the centre plate of the index. The horizon-glaſs F is fixed in a frame that turns on the axes or pivots, which move in an exterior frame; the holes in which the pivots move may be tightened by four ſcrews in the exterior frame. G is a ſcrew by which the horizion glaſs may be ſet perpendicular to the plane of the inſtrument: ſhould this ſcrew become looſe or move too eaſy, it may be eaſily tightened by turning the capſtan-headed ſcrew H, which is on one ſide of the ſocket through which the ſtem of the finger ſcrew paſſes.

Plate CCXLIII.

The ſextant is furniſhed with a plain tube (fig. 75.) without any glaſſes; and to render the objects ſtill more diſtinct, it has two teleſcopes, one (fig. 76.) repreſenting the objects erect, or in their natural poſition: the longer one (fig. 77.) ſhows them inverted? it has a large field of view and other advantages, and a little uſe will ſoon accuſtom the obſerver to the inverted poſition, and the inſtrument will be as readily managed by it as by the plain tube alone. By a teleſcope the contact of the images is more perfectly diſtinguiſhed; and by the place of the images in the field of the teleſcope, it is eaſy to perceive whether the ſextant is held in the proper place for obſervation. By ſliding the tube that contains the eye-glaſſes in the inſide of the other tube, the object is ſuited to different eyes, and made to appear perfectly diſtinct and well defined.

The teleſcopes are to be ſcrewed into a circular ring at K, this ring reſts on two points againſt an exterior ring, and is held thereto by two ſcrews; by turning one or other of theſe ſcrews, and tightening the other, the axis of the teleſcope may be ſet parallel to the plane of the ſextant. The exterior ring is fixed on a triangular braſs ſtem that ſlides in a ſocket, and by means of a ſcrew at the back of the quadrant may be raiſed or lowered ſo as to move the centre of the teleſcope to point to that part of the horizon-glaſs which ſhall be judged the moſt fit for obſervation. Fig. 78. is a circular head, with tinged glaſſes to ſcrew on the eye end of either of the teleſcopes or the plain tube. The glaſſes are contained in a circular plate which has four holes; three of theſe are fitted with tinged glaſſes, the fourth is open By preſſing the finger againſt the projecting edge of this plate and turning it round, the open hole, or any of the tinged glaſſes, may be brought between the eye-glaſs of the teleſcope and the eye.

Fig 79. is a magnifying glaſs, to aſſiſt the obſerver to read off the angle with more accuracy; and (fig. 80.)a ſcrew-driver.

Adjuſtments of the Sextant.

The adjuſtments of a ſextant are, to ſet the mirrors perpendicular to its plane and parallel to each other when the index is at Zeno, and to ſet the axis of the teleſcope parallel to the plane of the inſtrument. The three firſt of theſe adjuſtments are performed nearly in the ſame manner as directed in the ſection on the quadrant: as, however, the ſextant is provided with a ſet of coloured glaſſes placed behind the horizon-glaſs, the index error may be more accurately determined by meaſuring the ſun's diameter twice, with the index placed alternately before and behind the beginning of the diviſions: half the difference of theſe two meaſures will be the index-error, which muſt be added to, or ſubtracted from, all obſervations, according as the diameter meaſured with the index to the left of *o* is leſs or greater than the diameter meaſured with the index to the right of the beginning of the diviſions.

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Adjuſtment IV. *To ſet the axis of the Teleſcope parallel to the Plane of the Inſtrument.*

Turn the eye end of the teleſcope until the two wires are parallel to the plane of the inſtrument and let two diſtant objects be ſelected, as two ſtars of the firſt magnitude, whoſe diſtance is not leſs than 90° or 100°: make the contact of theſe objects as perfect as poſſible at the wire neareſt the plane of the inſtrument; fix the index in this poſition; move the ſextant till the objects are ſeen at the other wire, and if the ſame points are in contact, the axis of the teleſcope is parallel to the plane of the ſextant; but if the objects are apparently ſeparted, or do parly cover each other, correct half the error by the ſcrews in the circular part of the ſupporter, one of which is above and the other between the teleſcope and ſextant; turn the adjuſting ſcrew at the end of the index till the limbs are in contact; then bring the objects to the wire next the inſtrument; and if the limbs are in contact, the axis of the teleſcope is adjuſted: if not, proceed as at the other wire, and continue till no error remains.

It is ſometimes neceſſary to know the angular diſtance between the wires of the teleſcope; to find which, place the wires perpendicular to the plane of the ſextant, hold the inſtrument vertical, direct the ſight to the horizon, and move the ſextant in its own plane till the horizon and upper wire coincide; keep the ſextant in this poſition, and move the index till the reflected horizon is covered by the lower wire; and the divſion ſhown by the index on the limb, corrected by the index error, will be the angular diſtance between the wires. Other and better methods will readily occur to the obſerver at land.

Uſe of the Sextant.

When the diſtance between the moon and the ſun or a ſtar is to be obſerved, the ſextant muſt be held ſo that its plane may paſs through the eye of the obſerver and both objects; and the reflected image of the moſt luminous of the two is to be brought in contact with the other ſeen directly. To effect this, therefore it is evident, that when the brighteſt object is to the right of the other, the face of the ſextant muſt be held upwards; but if to the left downwards. When the face of the ſextant is held upwards, the inſtrument ſhould be ſuported with the right hand, and the index moved with the left hand. But when the face of the ſextant is from the obſerver, it ſhould be held with the

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the left hand, and the motion of the index regulated by the right hand.

Sometimes a ſitting poſture will be found very convenient for the obſerver, particularly when the reflected object is to the right of the direct one; in this caſe, the inſtrument is ſupported by the right hand, the elbow may reſt on the right knee, the right leg at the ſame time reſting on the left knee.

If the ſextant is provided with a ball and ſocket, and a ſtaff, one of whoſe ends is attached thereto, and the other reſts in a belt faſtened round the body of the obſerver, the greater part of the weight of the inſtrument will by this means be ſupported by his body.

To obſerve the Diſtance between the Moon and any celeſtial object.

1. Between the ſun and moon.

Put the teleſcope in its place, and the wires parallel to the plane of the inſtrument; and if the ſun is very bright, raiſe the plate before the ſilvered part of the ſpeculum; direct the teleſcope to the tranſparent part of the horizon-glaſs, or to the line of ſeparation of the ſilvered and tranſparent parts according to the brightneſs of the ſun, and turn down one of the coloured glaſſes, then hold the ſextant ſo that its plane produced may paſs through the ſun and moon, having its face either upwards or downwards according as the ſun is to the right or left of the moon; direct the ſight through the teleſcope to the moon; and move the index till the limb of the ſun is nearly in contact with the enlightened limb of the moon; now faſten the index, and by a gentle motion of the inſtrument make the image of the ſun move alternately paſt the moon; and, when in that poſition where the limbs are neareſt each other, make the coincidence of the limbs perfect by means of the adjuſting ſcrew; this being effected, read off the degrees and parts of a degree ſhown by the index on the limb; uſing the magnifying glaſs; and thus the angular diſtance between the neareſt limbs of the ſun and moon is obtained,

2. Between the moon and a ſtar.

Direct the middle of the field of the teleſcope to the line of ſeparation of the ſilvered and tranſparent parts of the horizon-glaſs; if the moon is very bright turn down the lighteſt coloured glaſs, and hold the ſextant ſo that its plane may be parallel to that paſſing through the eye of the obſerver and both objects; its face being upwards if the moon is to the right of the ſtar, but if to the left, the face is to be held from the obſerver; now direct the ſight through the teleſcope to the ſtar, and move the index till the moon appears by reflection to be nearly in contact with the ſtar; faſten the index, and turn the adjuſting ſcrew till the coincidence of the ſtar and enlightened limb of the moon is perfect: and the degrees and parts of a degree ſhown by the index will be the obſerved diſtance between the moon's enlightened limb and the ſtar.

The contact of the limbs muſt always be obſerved in the middle betwen the parallel wires.

It is ſometimes difficult for thoſe not much accuſtomed to obſervations of this kind, to find the reflected image in the horizon-glaſs: it will perhaps in this caſe be found more convenient to look directly to the object, and, by moving the index, to make its image coincide with that ſeen directly.

Sect. III. *Of the circular Inſtrument of Reflection.*

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This inſtrument was propoſed with a view to correct the errors to which the ſextant is liable; particularly the error ariſing from the inaccuracy of the diviſions on the limb. It conſiſts of the following parts: a circular ring or limb, two moveable indices, two mirrors, a teleſcope, coloured glaſſes, &c.

The limb of this inſtrument is a complete circle of metal, and is connected with a perforated central plate by ſix radii: it is divided into 720 degrees; each degree is divided into three equal parts; and the diviſion is carried to minutes by means of the index ſcale as uſual.

The two indices are moveable about the ſame axis, which paſſes exactly through the centre of the inſtrument:—the firſt index carries the central mirror, and the other the teleſcope and horizon glaſs; each index being provided with an adjuſting ſcrew for regulating its motion, and a ſcale for ſhowing the diviſions on the limb.

The central mirror is placed on the firſt index immediately above the centre of the inſtrument, and its plane makes an angle of about 30° with the middle line of the index. The four ſcrews in its pedeſtal for making its plane perpendicular to that of the inſtrument have ſquare heads, and are therefore eaſily turned either way by a key for that purpoſe.

The horizon-glaſs is placed on the ſecond index near the limb, ſo that as few as poſſible may be intercepted of the rays proceeding from the reflected object when to the left. The perpendicular poſition of this glaſs is rectified in the ſame manner as that of the horizon-glaſs of a ſextant, to which it is ſimilar. It has another motion, whereby its plane may be diſpoſed ſo as to make a proper angle with the axis of the teleſcope, and a line joining its centre, and that of the central mirror.

The teleſcope is attached to the other end of the index. It is an achromatic aſtronomical one, and therefore inverts objects; it has two parallel wires in the common focus of the glaſſes, whoſe angular diſtance is between two and three degrees, and which, at the time of obſervation, muſt be placed parallel to the plane of the inſtrument. This is eaſily done, by making the mark on the eye-piece coincide with that on the tube. The teleſcope is moveable by two ſcrews in a vertical direction with regard to the plane of the inſtrument, but is not capable of receiving a lateral motion.

There are two ſets of coloured glaſſes, each ſet containing four, and differing in ſhade from each other. The glaſſes of the larger ſet, which belongs to the central mirror, ſhould have each about half the degree of ſhade with which the correſpondent glaſs of the ſet belonging to the horizon mirror is tinged. Theſe glaſſes are kept tight in their places by ſmall preſſing ſcrews, and make an angle of about 85° with the plane of the inſtrument; by which means the image from the coloured glaſs is not reflected to the teleſcope. When the angle to be meaſured is between 5° and 34°, one of the glaſſes of the largeſt ſet is to be placed before the horizon-glaſs.

The handle is of wood and is ſcrewed to the back of the inſtrument, immediately under the centre, with which it is to be held at the time of obſervation.

Plate CCCXIII.

Fig. 81. is a plan of the inſtrument, wherein the limb is repreſented by the divided circular plate; A is the central mirror, *a a*, the places which receive the ſtems *a a* of the glaſs fig. 84; EF, the firſt or central index, with its ſcale and adjuſting ſcrew; MN, the ſecond or horizon index; GH, the teleſcope; IK, the ſcrews for moving it towards or from the plane of the inſtrument: C, the place of the coloured glaſs fig. 83; and D, its place in certain obſervations.

Fig. 82. is a ſection of the inſtrument, wherein the ſeveral parts are referred to by the ſame letters as in fig. 81: Fig. 83. repreſents one of the horizon coloured glaſſes; and fig. 84. one of the central coloured glaſſes: Fig. 85. is the key for turning the adjuſting ſcrews of the mirrors: Fig. 86. is the handle: Fig. 87. a ſection of one of the radii towards its middle: Fig. 88. is uſed in ſome terreſtrial obſervations for diminiſhing the light of the direct object, whoſe place at the time of obſervation is D: Fig. 89 is the tool for adjuſting the central mirror, and for rectifying the poſition of the teleſcope with regard to the plane of the inſtrument; there is another tool exactly of the ſame ſize. The height of theſe is nearly equal to that of the middle of the central mirror.

Adjuſtments of the Circular Inſtrument.

I. *To ſet the horizon-glaſs ſo that none of the rays from the central mirror ſhall be reflected to the teleſcope from the horizon mirror, without paſſing through the coloured glaſs belonging to this laſt mirror.*—Place the coloured glaſs before the horizon mirror; direct the teleſcope to the ſilvered part of that mirror, and make it nearly parallel to the plane of the inſtrument; move the firſt index; and if the rays from the central mirror to the horizon-glaſs, and from thence to the teleſcope, have all the ſame degree of ſhade with that of the coloured glaſs uſed, the horizon-glaſs is in its proper poſition; otherwiſe the pedeſtal of the glaſs muſt be turned until the uncoloured images diſappear.

II. Place the two adjuſting tools on the limb, about 350° of the inſtrument diſtant, one on each ſide of the diviſion on the left, anſwering to the plane of the central mirror produced: then the eye being placed at the upper edge of the neareſt tool, move the central index till one half only of the reflected image of this tool is ſeen in the central mirror towards the left, and move the other tool till its half to the right is hid by the ſame edge of the mirror; then, if the upper edges of both tools are apparently in the ſame ſtraight line, the central mirror is perpendicular to the plane of the inſtrument; if not bring them into this poſition by the ſcrews in the pedeſtal of the mirror.

III. *To ſet the horizon mirror perpendicular to the plane of the inſtrument.*—The central mirror being previouſly adjuſted, direct the ſight through the teleſcope to any well defined diſtant object; then if, by moving the central index, the reflected image paſſes exactly over the direct object, the mirror is perpendicular; if not, its poſition muſt be rectified by means of the ſcrews in the pedeſtal of the glaſs.

A planet, or ſtar of the firſt magnitude, will be found a very proper object for this purpoſe.

IV. *To make the line of collimation parallel to the plane of the inſtrument.*—Lay the inſtrument horizontally on a table; place the two adjuſting tools on the limb, towards the extremities of one of the diameters of the inſtrument; and at about 15 or 20 feet diſtant let a well defined mark be placed ſo as to be in the ſame ſtraight line with the tops of the tools; then raiſe or lower the teleſcope till the plane paſſing through its axis and the tops of the tools is parallel to the plane of the inſtrument, and direct it to the fixed object; turn either or both of the ſcrews of the teleſcope till the mark is apparently in the middle between the wires; then is the teleſcope adjuſted; and the difference, if any, between the diviſions pointed out by the indices of the ſcrews will be the error of the indices. Hence this adjuſtment may in future be eaſily made.

In this proceſs the eye tube muſt be ſo placed as to obtain diſtinct viſion.

V. *To find that diviſion to which the ſecond index being placed the mirrors will be parallel, the central index being at Zero.*—Having placed the firſt index exactly to *o*, direct the teleſcope to the horizon mirror, ſo that its field may be biſected by the line of ſeparation of the ſilvered and tranſparent parts of that mirror; hold the inſtrument vertically, and move the ſecond index until the direct and reflected horizons agree; and the diviſion ſhown by the index will be that required.

This adjuſtment may be performed by meaſuring the ſun's diameter in contrary directions, or by making the reflected and direct images of a ſtar or planet to coincide.

Uſe of the Circular Inſtrument.

To obſerve the diſtance between the ſun and moon.

I. The ſun being to the right of the moon.

Set a proper coloured glaſs before the central mirror, if the diſtance between the objects is leſs than 35°; but if above that quantity, place a coloured glaſs before the horizon mirror: make the mirrors parallel, the firſt index being at *o*, and hold the inſtrument ſo that its plane may be directed to the objects, with its face downwards, or from the obſerver: direct the ſight through the teleſcope to the moon: move the ſecond index, according to the order of the diviſions on the limb, till the neareſt limbs of the ſun and moon are almoſt in contact: faſten that index, and make the coincidence of the limbs perfect by the adjuſting ſcrew belonging thereto: then invert the inſtrument, and move the central index towards the ſecond by a quantity equal to twice the arch paſſed over by that index: direct the plane of the inſtrument to the objects: look directly to the moon, and the ſun will be ſeen in the field of the teleſcope: faſten the central index, and make the contact of the ſame two limbs exact by means of the adjuſting ſcrew: Then half the angle ſhown by the central index will be the diſtance between the neareſt limbs of the ſun and moon.

II. The ſun being to the left of the moon.

Hold the inſtrument with its face upwards, ſo that its plane may paſs through both objects; direct the teleſcope to the moon, and make its limb coincide with the neareſt limb of the ſun's reflected image, by moving the ſecond index: now put the inſtrument in an oppoſite poſition; direct its plane to the objects, and the ſight to the moon, the central index being previouſly moved towards the ſecond by a quantity equal to twice the meaſured diſtance; and make the ſame two limbs

limbs that were before obſerved coincide exactly, by turning the adjuſting ſcrew of the firſt index: then half the angle ſhown by the firſt index will be the angular diſtance between the obſerved limbs of the ſun and moon.

To obſerve the angular Diſtance between the Moon and a Fixed Star or Planet.

I. The ſtar being to the right of the moon.

In this caſe the ſtar is to be conſidered as the direct object; and the enlightened limb of the moon's reflected image is to be brought in contact with the ſtar or planet, both by a direct and inverted poſition of the inſtrument, exactly in the ſame manner as deſcribed in the laſt article. If the moon's image is very bright, the lighteſt tinged glaſs is to be uſed.

II. The ſtar being to the left of the moon.

Proceed in the ſame manner as directed for obſerving the diſtance between the ſun and moon, the ſun being to the right of the moon, uſing the lighteſt tinged glaſs if neceſſary.

SECT IV. *Of the Method of determining the Longitude from Obſervation.*

PROB. I. To convert degrees or parts of the equator into time.

RULE. Multiply the degrees and parts of a degree by 4, beginning at the loweſt denomination, and the product will be the correſponding time. Obſerving that minutes multiplied by 4 produce ſeconds of time, and degrees multiplied by 4 give minutes.

EXAMPLE I. Let 26° 45′ be reduced to time.

26° 45′
4

1h 47′ 0″=time required.

EXAMPLE II. Reduce 83° 37′ to time.

83° 37′
4

Correſponding time=5 34 28

PROB. II. To convert time into degrees.

RULE. Multiply the given time by 10, to which add the half of the product. The ſum will be the correſponding degrees.

EXAMPLE I. Let 3h 4′ 28″ be reduced to degrees.

3h 4′ 28″
10

30 44 40
Half = 15 22 20

Correſponding deg. = 46 7 0

EXAMPLE II. Reduce 8h 42′ 36″ to degrees.

8h 42′ 36″
10

87 6 0
43 33 0

Anſwer 130 39 0

PROB. III. Given the time under any known meridian, to find the correſponding time at Greenwich.

RULE. Let the given time be reckoned from the preceding noon, to which the longitude of the place in time is to be applied by addition or ſubtraction, according as it is eaſt or weſt; and the ſum or difference will be the correſponding time at Greenwich.

EXAMPLE I. What time at Greenwich anſwers to 6h 15′ at a ſhip in longitude 76° 45 W?

Time at ſhip - - 6h 15
Longitude in time - 5 7 W.

Time at Greenwich, 11 22

EXAMPLE II. Required the time at Greenwich anſwering to 5h 46′ 39″ of May 1ſt, at Canton, whoſe longitude is 113° 2′ 15″ E.?

Time at Canton, May 1ſt 5h 46′ 39
Longitude in time - 7 32 9 E.

Time at Greenwich, April 30. 22 14 30

PROB. IV. To reduce the time at Greenwich to that under any given meridian.

RULE. Reckon the given time for the preceding noon, to which add the longitude in time if eaſt, but ſubtract it if weſt; and the ſum or remainder will be the correſponding time under the given meridian.

EXAMPLE I. What is the expected time of the beginning of the lunar eclipſe of February 25, 1793, at a ſhip in longitude 109° 48′ E?

Beg. of eclipſe at Greenwich *per* Naut Alm. 9h 23′ 45″
Ship's longitude in time, - - 7 19 12

Time of beginning of eclipſe at ſhip, 16 42 57

EXAMPLE II. At what time may the immerſion of the firſt ſatellite of Jupiter be obſerved at Port St Julian, in longitude 68° 44′ W. which by the Nautical Almanac happens at Greenwich 24th March 1792, at 17h 53′ 1″?

App. time of immerſion at Greenwich 17h 53′ 1″
Longitude of Pot St Julian in time, 4 34 56 W.

App. time of immer. at Port St Julian, 13 18 5

PROB. V. To find the equation of equal latitudes.

RULE. To the co-ſecant of half the interval of time in degrees add the tangent of the latitude, and to the cotangent of half the interval add the tangent of the declination: Now if the latitude and declination be of a contrary name, add the correſponding natural numbers; but if of the ſame name, ſubtract them. Then to the ar. co. log. of this ſum or difference add the proportional logarithm of one-fourth of the interval expreſſed in time, and the proportional logarithm of the daily variation of declination, the ſum will be the proportional logarithm of the equation of equal altitudes in minutes and ſeconds, which are to be eſteemed ſeconds and thirds.

EXAMPLE. Let the latitude of the place of obſervation be 57° 9′ N, the interval of time between the obſervations of the equal altitudes 5h 17′, the ſun's declination 17° 48′ S, and the daily change of declination 16° 19′½: Required the equation of equal altitudes?

Half the interval=2h 38′½=39° 37′
½ int.=39° 37 coſ^t. 0.19542 cotang. 0.08209
Lat. 57 9 tan. 0.18997 dec. 17° 48′ ta. 9.50659

0.38539 2.4288
3879 9.58868

Sum - - 2.8167 ar. co.lo.9.5503
One-

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One-fourth interval	1h 19' 15"	P. L. 0.3563
Daily variation of declination	16' 19"½	P. L. 1.0424
Equation of equal altitudes	20" 14'''	P. L. 0.9490

Prob. VI. To find the error of a watch by equal altitudes of the ſun.

Rule. In the morning when the ſun is more than two hours diſtant from the meridian, let a ſet of obſervations be taken, conſiſting, for the ſake of greater accuracy, of at leaſt three altitudes, which, together with the correſponding times *per* watch, are to be wrote regularly, the time of each obſervation being increaſed by 12 hours. In the afternoon, obſerve the inſtants when the ſun comes to the ſame altitudes, and write down each oppoſite to its reſpective altitude.—Now half the ſum of any two times anſwering to the ſame altitude will be the time of noon *per* watch uncorrect. Find the mean of all the times of noon thus deduced from each correſponding pair of obſervations, to which the equation of equal altitudes is to be applied by addition or ſubtraction according as the ſun is receding from or approaching to the elevated pole, and the ſum or difference will be the time *per* watch of apparent noon, the difference between which and noon will be the error of the watch for apparent time; and the watch will be faſt or ſlow according as the time of noon thereby is more or leſs than twelve hours.

Example. January 29, 1786, in lat. 57° 9' N, the following equal altitudes of the ſun were obſerved: Required the error of the watch?

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Alt = 8° 5'	Time	21h	35'	8" A.M.	2h	57'	43" P.M.
8 10			36	8		54	42
8 20			38	9		52	41.2
8 25			39	12.5		51	38
				37.5			4.2
		21	37	9.37	2	53	41.05
					21	37	9.37
Sum					24	30	50.42
Time of noon *per* watch uncorrected					12	15	25.2
Equation of equal altitudes					= 0	0	20.2
Time *per* watch of apparent noon					12	15	5.
Watch faſt						15	5.

The mean time of noon *per* watch is found by applying the equation of time with a contrary ſine.

In practice it will be found convenient to put the index of the quadrant to a certain diviſion, and to wait till either limb of the ſun attains that altitude.

Prob. VII. Given the latitude of a place, the altitude and declination of the ſun to find the apparent time, and the error of the watch.

Rule. If the latitude and declination are of different names, let their ſum be taken; otherwiſe, their difference. From the natural coſine of this ſum or difference ſubtract the natural ſine of the corrected altitude. and find the logarithm of the remainder; to which add the log. ſecants of the latitude and declination: the ſum will be the log. riſing of the horary diſtance of the object from the meridian, and hence the apparent time will be known.

Example. I. September 15th 1792, in latitude 33° 56' S, and longitude 18° 22' E, the mean of the times *per* watch was 8h 12' 10" A. M. and that of the altitudes of the ſun's lower limb 24° 48'; height of the eye 24 feet. Required the error of the watch?

Obſ. alt. Sun's lower limb	24° 48'	Sun's declin. at noon per Naut. Almanac		2° 40'.5 S.
Semidiameter	+ 16.0	Equation to 3h 48' A. M.		+ 3.7
Dip	— 4.7	to 18° 22' Eaſt		+ 1.2
Correction	— 1.9	Reduced declination		2 45.4 S.
True altitude Sun's centre	24 57.4			
Latitude	33 56	ſecant		0.08109
Declination	2 45.4	ſecant		0.00050
Sum	36 41.4	nat. coſine	80188	
Sun's altitude	24 57.4	nat. ſine	42193	
		Difference	37995 log.	4.57973
Sun's meridian diſtance	3h 48' 51"	riſing		4.66132
Apparent time	8 11 9			
Time per watch	8 12 10			
Watch faſt	1 1			

Example II. May 6th 1793, in latitude 56° 4' N, and longitude 38° 30' W, at 4h 37' 4" P. M. per watch, the altitude of the ſun's lower limb was 25° 6.1, and height of the eye 19 feet. Required the error of the watch for apparent time?

Altitude ſun's lower limb	= 25° 6'.1	Sun's declin. per Nautical Almanac	16° 44.3
Semidiameter	+ 15.9	Equation to 4h 37. P. M.	+ 3.4
Dip	— 4.1	to 38° 30. W.	+ 1.8
Correction	— 1.9	Reduced declination	16 49.5
True alt. ſun's centre	25 16.0		

Latitude

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Latitude	56 4.0 N.	ſecant		0.25319
Declination	16 49.5 N.	ſecant		0.01900
Difference	39 14.5	nat. coſine	77448	
Sun's altitude	25 16.0	nat. ſine	42683	
		Difference	34765	4.54114
Apparent time	4h 38′ 12″	riſing		4.81333
Time per watch	4 37 4			
Watch ſlow	1 8			

Prob. VIII. Given the latitude of a place, the altitude of a known fixed ſtar, and the ſun's right aſcenſion, to find the apparent time of obſervation and error of the watch.

Rule. Correct the obſerved altitude of the ſtar, and reduce its right aſcenſion and declination to the time of obſervation.

With the latitude of the place, the true altitude and declination of the ſtar, compute its horary diſtance from meridian by laſt problem; which being added to or ſubtracted from its right aſcenſion according as it was obſerved in the weſtern or eaſtern hemiſphere, the ſum or remainder will be the right aſcenſion of the meridian.

From the right aſcenſion of the meridian ſubtract the ſun's right aſcenſion as given in the Nautical Almanac for the noon of the given day, and the remainder will be the approximate time of obſervation; from which ſubtract the proportional part of the daily variation of right aſcenſion anſwering thereto, and let the proportional part anſwering to the longitude be added or ſubtracted according as the longitude is eaſt or weſt, and the reſult will be the apparent time of obſervation; and hence the error of the watch will be known.

Example I. December 12th 1792, in latitude 37° 46, N, and longitude 21° 15, E, the altitude of Arcturus eaſt of the meridian was 34° 6′.4, the height of the eye 10 feet. Required the apparent time of obſervation?

Obſerved alt. of Arcturus	34° 6′.4		
Dip and refraction	— 4.4		
True altitude	34 2.0		
Latitude	37 46.0 N.	ſec.	0.10209
Declination	20 14.4 N.	ſec.	0.02778
Difference	17 31.6 N.	co. 95358	
Altitude of Arcturus	34 2.0 N.	ſine 55968	
		Difference 39390	4.59539
Arcturus's merid. diſt.	4h 8′ 10″	riſing	4.72526
right aſ.	14 6 13		
Right aſ. of merid.	9 58 3		
Sun's right aſ.	17 21 59		
Approximate time	16 36 4		
Eq. to approx. time	— 3 3		
Eq. to longitude	+ 16		
Ap. time of obſ.	16 83 17		

Example II. January 29th 1792, in latitude 53° 24′ N. and longitude 25° 18′ W, by account, at 14h 58′ 38″, the altitude of Procyon weſt of the meridian was 19° 58′; height of the eye 20 feet. Required the error of the watch?

Obſ. alt. of Procyon	19° 58,		
Dip and refraction	7		
True altitude	19 51		
Latitude	53 24	ſecant	0.22459
Declination	5 45	ſecant	0.00219
Difference	47 39	nat. coſ. 67366	
Altitude of Procyon	19 51	nat. ſine 33956	
		Difference 33410	4.52388
Procyon's merid. diſt.	4h 16′ 24″	riſing	4.75066
right aſ.	7 28 24		
Right aſ. of merid.	11 44 48		
Sun's right aſ.	20 47 22		
Approximate time	14 57 26		
Eq. to ap. time	—0 2 36		
Eq. to long.	—0 0 17		
Apparent time	14 54 33		
Time per watch	14 58 38		
Watch faſt	0 4 5		

Prob. IX. Given the altitude of the moon, the latitude of a place, and the apparent time at Greenwich, to find the apparent time at the place of obſervation.

Rule. Correct the altitude of the moon's limb by Problem V. p. 731, and reduce its right aſcenſion and declination, and the ſun's right aſcenſion to the Greenwich time of obſervation. Now with the latitude of the place, the declination and altitude of the moon, compute its meridian diſtance as before: Which being applied to its right aſcenſion by addition or ſubtraction, according as it is in the weſtern or eaſtern hemiſphere, will give the right aſcenſion of the meridian. Then the ſun's right aſcenſion ſubtracted from the right aſcenſion of the meridian, will give the apparent time of obſervation.

Example. March 3d 1792, in latitude 51° 38′ N, at 11h 29′ 7″ P. M. per watch, the altitude of the moon's lower limb was 37° 31′, the height of the eye being 10 feet, and the time at Greenwich 13h 43′. Required the error of the watch?

Alti-

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Altitude of the moon's lower limb	=37° 31′	Moon's right aſcenſion at Green. time		7h 22′ 54″
Semidiameter - -	+ 15	declination - -		17h 0 N.
Dip - - -	— 3	Sun's right aſcenſion - -		23h 2′ 0″
Correction - - -	+ 42			
Correct altitude of moon's centre	38 25	- - ſecant - -		0.20712
Latitude - - -	51 38 N.	- - ſecant - -		0.01940
Declination - -	17 0 N.	Nat. coſine -	82281	
		Nat. ſine -	62138	
Difference - -	34 38			
Moon's altitude - -	38 25	Difference -	20143	4.30412
		riſing - - -		4.53064
Moon's meridian diſtance -	3° 14 36			
right aſcenſion -	7 22 54			
Right aſcenſion of meridian	10 37 30			
Sun's right aſcenſion - -	23 2 0			
Apparent time at ſhip, - -	11 35 30			
Time per watch - -	11 29 7			
Watch ſlow. - -	6 23			

Prob. X. Given the apparent diſtance between the moon and the ſun or a fixed ſtar, to find the true diſtance.

Rule. To the logarithmic difference anſwering to the moon's apparent altitude and horizontal parallax, add the logarithmic ſines of half the ſum, and half the difference of the apparent diſtance and difference of the apparent altitudes; half the ſum will be the logarithmic coſine of an arch: now add the logarithm ſines of the ſum and difference of this arch, and half the difference of the true altitudes, and half the ſum will be the logarithmic coſine of half the true diſtance.

Example. Let the apparent altitude of the moon's centre be 48° 22′, that of the ſun's 27° 43′, the apparent central diſtance 81° 23′ 40″, and the moon's horizontal parallax 58′ 45″. Required the true diſtance?

Apparent altitude ſun's centre -	27° 43′ 0″	Apparent altitude moon's centre			48° 22′ 0″
Correction - - -	— 1 40″	Correction - -			+ 38 26
Sun's true altitude - -	27 41 20	Moon's true altitude - -			49 0 26
Sun's apparent altitude -	27 43	Sun's true altitude - -			27 41 20
Moon's apparent altitude, -	48 22	Difference - -			21 19 6
Difference - - -	20 39	Half - -			10 39 33
Apparent diſtance - -	81 23 40	Logarithmic difference			9.994638
Sum - - -	102 2 40	Half -	51° 1′ 20″	Sine	9.890639
Difference - - -	60 44 40	Half -	30 22 20	Sine	9.703820
Half difference true altitudes -	10 39 33				19.589097
Arch - - -	51 27 29	- - coſine - -			9.794548
Sum - - -	62	- - ſine - - -			9.946417
Difference - -	40 47 56	- - ſine - - -			9.815183
					19.761600
	40 32 16	- - coſine - -			9.880800
	2				
True diſtance - -	81 4 32				

Prob. XI. To find the time at Greenwich anſwering to a given diſtance between the moon and the ſun, or one of the ſtars, uſed in the Nautical Almanac.

Rule. If the given diſtance is found in the Nautical Almanac oppoſite to the given day of the month, or to that which immediately precedes or follows it, the time is found at the top of the page. But if this diſtance is not found exactly in the ephemeris, ſubtract the prop. log. of the difference between the diſtances which immediately precede and follow the given diſtance; from the prop. log. of the difference between the given and preceding diſtances, the remainder will be the prop. log. of the exceſs of the time corre-

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corresponding to the given diſtance, above that anſwering to the preceding diſtance: And hence the apparent time at Greenwich is known.

Example. September 21, 1792, the true diſtance between the centres of the ſun and moon was 68° 13′ 8″. Required the apparent time at Greenwich?

Given diſtance	68° 13′ 8″				
Diſt. at ix hours	67 53 27	Diff.=0° 19′ 41″	P. log. 9612		
Diſt. at xii hours	69 30 6	Diff.=1 36 39	P. log. 2701		
Exceſs - -		0 36 39	P. log. 6911		
Preceding time -		9 0 0			
App. time at Greenwich		9 36 39			

Prob. XII. The latitude of a place and its longitude by account being given, together with the diſtance between, and the altitude of the moon and the ſun, or one of the ſtars in the Nautical Almanac; to find the true longitude of the place of obſervation.

Rule. Reduce the eſtimate time of obſervation to the meridian of Greenwich by Problem III. and to this time, take from the Nautical Almanac page vii. of the month, the moon's horizontal parallax and ſemidiameter. Increaſe the ſemidiameter by the augmentation anſwering to the moon's altitude.

Find the apparent and true altitudes of each object's centre, and the apparent central diſtance; with which compute the true diſtance by Problem X. and find the apparent time at Greenwich anſwering thereto by the laſt problem.

If the ſun or ſtar be at a proper diſtance from the meridian at the time of obſervation of the diſtance, compute the apparent time at the ſhip. If not, the error of the watch may be found from obſervations taken either before or after that of the diſtance; or the apparent time may be inferred from the moon's altitude taken with the diſtance, by Problem IX.

The difference between the apparent times of obſervation at the ſhip and Greenwich, will be the longitude of the ſhip in time; which is eaſt or weſt according as the time at the ſhip is later or earlier than the Greenwich time.

Example I. March 17. 1792, in latitude 34° 53′ N, and longitude by account 27° W, about 9h A. M. the diſtance between the neareſt limbs of the ſun and moon was 68° 3′ 15″; the altitude of the ſun's lower limb 33° 18′; that of the moon's upper limb 31° 3′; and the height of the eye 12 feet. Required the true longitude of the ſhip?

Time at ſhip - -	9h	0′	A. M.	
Longitude in time - -	1	48		
Reduced time - -	10	48	A. M.	
Altitude moon's upper limb -	31	3	0	
Aug. ſemidiameter - -	—	16	19	
Dip - - -	—	3	18	
Apparent altitude -	30	43	23	
Correction - - -	+	49	26	
Moon's true altitude -	31	32	49	

Diſt. ſun and moon's neareſt limbs	68°	3	15″
Sun's ſemidiameter -	+	16	6
Moon's ſemidiameter -	+	16	10
Augmentation - -	+	0	9
Apparent central diſtance -	68	35	40
Altitude ſun's lower limb -	33	18	
Sun's ſemidiameter -	+	16	6
Dip - -	—	3	18
Sun's apparent altitude -	33	30	48
Correction - -	—0	1	19
Sun's true altitude - -	33	29	29
Moon's true altitude -	31	32	49
Difference - -	1	56	40
Half - - -	0	58	20

Sun's apparent altitude -	33°	30′	48		
Moon's apparent altitude -	30	43	23		
Difference - -	2	47	25		
Apparent diſtance -	68	35	40	Logarithmic difference -	9.996336
Sum - -	71	23	5	Half - 35° 41′ 32″ ½ Sine -	9.765991
Difference - -	65	48	15	Half - 32 54 7 ½ Sine -	9.731964
					19.497955
Half difference true altitudes	0	58	20		
Arch - -	55	54	12	Coſine -	9.748645
Sum - -	56	52	32	Sine -	9.922977
Difference - -	54	55	52	Sine -	9.912998
					19.835975
Half true diſtance -	34	6	53 2	Coſine -	9.917987
True diſtance - -	68	13	46		

Of finding the Longitude at Sea by Lunar Obſervations.

Of finding the Longitude at Sea by Lunar Obſervations.

True diſtance	68° 13 46″				
Diſtance at XXI hours	69 11 20	Difference	0° 57″ 34″	P. log.	4951
Diſtance at noon	67 32 38	Difference	1 38 42	P. log.	2610
Proportional part			1 45 0	P. log.	2341
Preceding time			21 0 0		
Apparent time at Greenwich			22 45 0		
Latitude	34° 53.0′ N	Secant			0.08602
Declination	0 57.9 S	Secant			0.00006
Sum	35 50.9	Nat. coſine	81057		
Sun's altitude	33 29.5	Nat. ſine	55181		
Difference			25876		4.41291
Time from noon	3h 7′ 13″		Riſing		4.49899
Apparent time	20 52 47				
App. time at Green.	22 45 0				
Longitude in time	1 52 13 = 28° 3′¼ W.				

Example II. September 2. 1792, in latitude 13° 57′ N, and longitude by account 56° E, ſeveral obſervations of the moon and altair were taken; the mean of the times *per* watch was 1h 18′ 59″ A. M. that of the diſtance between altair and the moon's neareſt limb 58° 45′ 26″; the mean of the altitude of the moon's lower limb 70° 33′; and that of altair 25° 27.4′; height of the eye 13 feet. Required the true longitude?

Time *per* watch	1h 18′ 59″ A. M.	Diſtance moon and altair			58° 45′ 26″
Longitude in time	3 44 0	Augmented ſemidiameter			+0 16 28
Reduced time	9 34 59	Apparent central diſtance			59 1 54
Altitude moon	70° 33′	Altitude of altair			25° 27′.4
Semidiameter and dip	−0 13	Dip			−0 3.4
Apparent alt. moon	70 20	Apparent altitude altair			25 24 0
Correction	+0 19 40	Refraction			−0 2 0
True altitude moon	70 39 40	True altitude altair			25 22 0
Moon's apparent alt.	70 20	Moon's true altitude			70 39 40
Altair's apparent alt.	25 24	Difference			45 17 40
Difference	44 56	Half			22 38 50
Apparent diſtance	59 1 54	Logarithmic difference			9.993101
Sum	103 57 54	Half	51° 58′ 57″	Sine	9.896428
Difference	14 5 54	Half	7 2 57	Sine	9.088919
Half diff. true alt.	22 38 50				18.978448
Arch	72 1 57			Coſine	9.489224
Sum	94 40 47			Sine	9.998548
Difference	49 23 7			Sine	9.880301
					19,878839
Half true diſtance	29 33 48½ 2			Coſine	9.939424
True diſtance	59 7 37				
Diſtance at IX hours	58 51 17	Difference	0° 16′ 20″	P. log.	1.0422
— at XII hours	60 24 34	Difference	1 33 17	P. log.	0.2855
Proportional part			0 31 31	P. log.	0.7567
Preceding time			9 0 0		
Apparent time at Greenwich			9 31 31		

Latitude

NAVIGATION.

Plate CCCXLIII

Fig. 74.

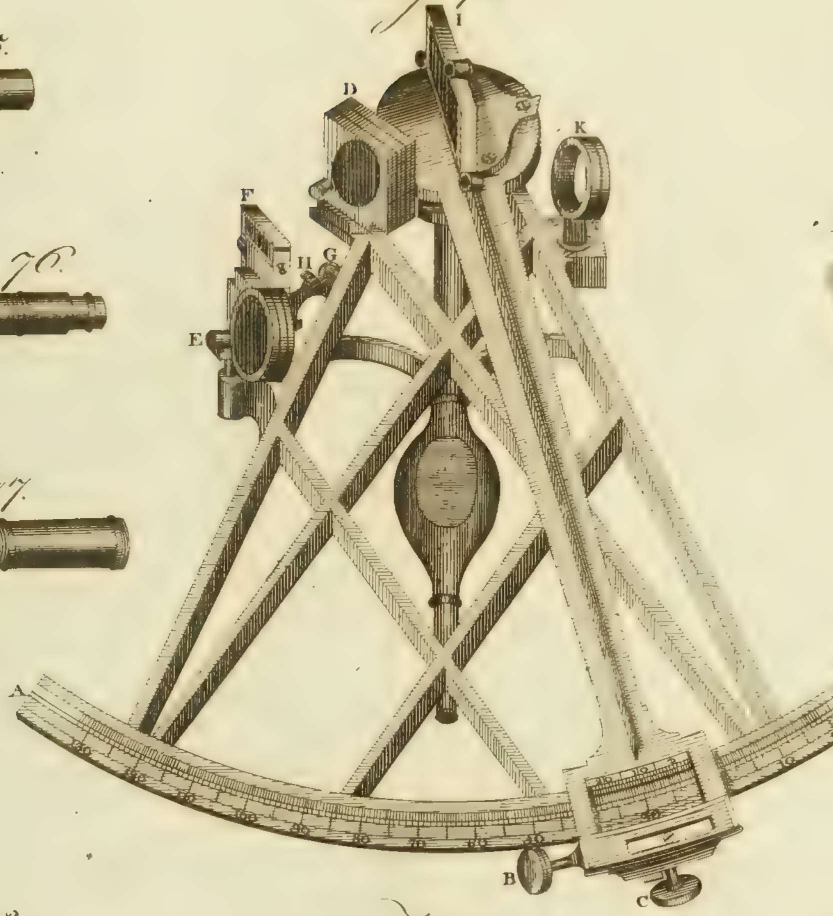


Fig. 75.

Fig. 76.

Fig. 77.

Fig. 78.

Fig. 79.

Fig. 80.

Fig. 83.

Fig. 81.

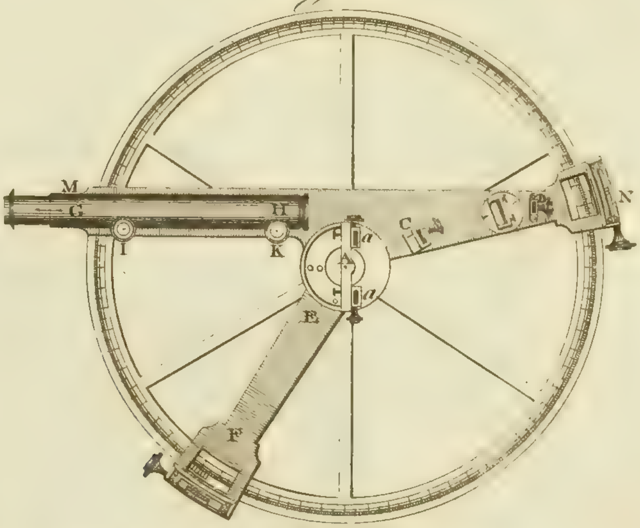


Fig. 86.

Fig. 84.

Fig. 87.

Fig. 88.

Fig. 85.

Fig. 82.

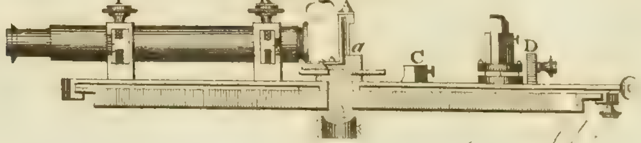


Fig. 89.

Latitude -	13° 57′ N		Secant -	0.01300
Declination -	8 19.8 N		Secant -	0.00461
Difference -	5 37.2	Nat. coſine -	99519	
Altitude altair -	25 22.	Nat. ſine -	42841	
Difference -	- - -		56678 - -	4.75341
Altair's meridian diſtance -	4h 23′ 14″	Riſing - -		4.77102
—— right aſcenſion -	19 40 40			
Right aſcenſion meridian -	0 3 54			
Sun's right aſcenſion -	10 46 17			
Apparent time at ſhip -	13 17 37			
Apparent time at Greenwich	9 31 31			
Longitude in time -	3 46 6 = 56° 31′½ Eaſt.			

For various other methods of determining the longitude of a place, the reader is referred to the article Longitude.

Chap. III. *Of the Variation of the Compaſs.*

The variation of the compaſs is the deviation of the points of the mariner's compaſs from the corresponding points of the horizon; and is denominated *eaſt* or *weſt* variation, according as the north point of the compaſs is to the eaſt or weſt of the true north point of the horizon.

A particular account of the variation, and of the ſeveral inſtruments uſed for determining it from obſervation, may be ſeen under the articles Azimuth, Compass, and Variation: and for the method of communicating magnetiſm to compaſs needles, ſee Magnetism.

Prob. I. Given the latitude of a place, and the ſun's magnetic amplitude, to find the variation of the compaſs.

Rule. To the log. ſecant of the latitude, add the log. ſine of the ſun's declination, the ſum will be the log. coſine of the true amplitude; to be reckoned from the north or ſouth according as the declination is north or ſouth.

The difference between the true and obſerved amplitudes reckoned from the ſame point, and if of the ſame name, is the variation; but if of a different name, their ſum is the variation.

If the obſervation be made in the eaſtern hemiſphere, the variation will be eaſt or weſt according as the obſerved amplitude is nearer to or more remote from the north than the true amplitude. The contrary rule holds good in obſervations taken in the weſtern hemiſphere.

Example I. May 15. 1794, in latitude 33° 10′ N, longitude 18° W, about 5h A. M. the ſun was obſerved to riſe E*b*N. Required the variation?

Sun's dec. May 15. at noon	18° 58′ N.		
Equation to 7h from noon	—0 4		
—— to 18° W	+0 1		
Reduced declination	18 55	Sine	9.51080
Latitude -	33 10	Secant	0.07723
True amplitude -	N 67 13 E	Coſine	9.58803
Obſerved amplitude	N 78 45 E		

Variation - - 11 32; which is *weſt*, becauſe the obſerved amplitude is more diſtant from the north than the true amplitude; the obſervation being made in the eaſtern hemiſphere.

Example II. December 20. 1793, in latitude 31° 38′ S, longitude 83° W, the ſun was obſerved to ſet SW. Required the variation?

Latitude -	31° 38′	Secant -	0.06985
Declination -	23 28	Sine -	9.60012
True amplitude	S 62 7 W	Coſine	9.66997
Obſerved ampl.	S 45 0 W		

Variation 17 7; which is *eaſt*, as the obſerved amplitude is farther from the north than the true amplitude, the obſervation being made at ſun-ſetting.

It may be remarked, that the ſun's amplitude ought to be obſerved at the inſtant the altitude of its lower limb is equal to the ſum of 15 minutes and the dip of the horizon. Thus, if an obſerver be elevated 18 feet above the ſurface of the ſea, the amplitude ſhould be taken at the inſtant the altitude of the ſun's lower limb is 19 minutes.

Prob. II. Given the magnetic azimuth, the altitude and declination of the ſun, together with the latitude of the place of obſervation; to find the variation of the compaſs.

Rule. Reduce the ſun's declination to the time and place of obſervation, and compute the true altitude of the ſun's centre.

Find the ſum of the ſun's polar diſtance and altitude and the latitude of the place, take the difference between the half of this ſum and the polar diſtance.

To the log. ſecant of the altitude add the log. ſecant of the latitude, the log. coſine of the half ſum, and the log. coſine of the difference; half the ſum of theſe will be the log. ſine of half the ſun's true azimuth, to be reckoned from the ſouth in north latitude, but from the north in ſouth latitude.

The difference between the true and obſerved azimuths will be the variation as formerly.

Example I. November 18. 1793, in latitude 50° 22′ N, longitude 24° 30′ W, about three quarters paſt eight A. M. the altitude of the ſun's lower limb was 8° 10′, and bearing *per* compaſs S 23 18 E; height of the eye 20 feet. Required the variation of the compaſs?

Sun's declin. 18th Nov. at noon	19° 25′ S.	Obſerved alt. ſun's lower limb	=8° 10
Equation to 3¼h from noon	— 2	Semidiameter	+ 16
———to 24° 30′ W	+ 1	Dip and refraction	— 10
Reduced declination	19 24	True altitude	8 16
Polar diſtance	109 24		
Altitude	8 16	Secant	0.00454
Latitude	50 22	Secant	0.19527
Sum	168 2		
Half	84 1	Coſine	9.01803
Difference	25 23	Coſine	9.95591
			19.17375
Half true azimuth	22 43	Sine	9.58687
	2		
True azimuth	S. 45 26 E.		
Obſerved azimuth	S. 23 18 E.		
Variation	22 8 W.		

Example II. January 3. 1794, in latitude 33° 52′ N, longitude 53° 15′ E, about half paſt three the altitude of the ſun's lower limb 41° 18′, and azimuth S. 50° 25′ W. the height of the eye being 20 feet. Required the variation?

Sun's declination at noon	21° 24′ S.	Obſerved alt. ſun's lower limb	=41° 18
Equation to time from noon	— 2	Sun's ſemidiameter	+ 16
———to longitude	+ 2	Dip and refraction	— 6
Reduced declination	21 24 S.	True altitude	41 28
Polar diſtance	111 24		
Altitude	41 28	Secant	0.12532
Latitude	33 52	Secant	0.08075
Sum	186 44		
Half	93 22	Coſine	8.76883
Difference	18 2	Coſine	9.97558
			18.95048
	17 23	Sine	9.47524
	2		
True azimuth	S. 34 46 W.		
Obſerved azimuth	S. 50 25 W.		
Variation	15 39 W.		

Chap. IV. *Of a Ship's Journal.*

A journal is a regular and exact regiſter of all the various tranſactions that happen aboard a ſhip whether at ſea or land, and more particularly that which concerns a ſhip's way, from whence her place at noon or any other time may be juſtly aſcertained.

That part of the account which is kept at ſea is called *ſea-work;* and the remarks taken down while the ſhip is in port are called *harbour work.*

At ſea, the day begins at noon, and ends at the noon of the following day: the firſt 12 hours, or thoſe contained between noon and midnight, are denoted by P. M. ſignifying *after mid-day;* and the other 12 hours, or thoſe from midnight to noon, are denoted by A. M. ſignifying *before mid-day.* A day's work marked Wedneſday March 6. began on Tueſday at noon, and ended on Wedneſday at noon. The days of the week are uſually repreſented by aſtronomical characters. Thus ☉ repreſents Sunday; ☽ Monday; ♂ Tueſday; ☿ Wedneſday; ♃ Thurſday; ♀ Friday; and ♄ Saturday.

When a ſhip is bound to a port ſo ſituated that ſhe will be out of ſight of land, the bearing and diſtance of the port muſt be found. This may be done by Mercator's or Middle-latitude Sailing; but the moſt expeditious method is by a chart. If iſlands, capes, or headlands intervene, it will be neceſſary to find the ſeveral courſe and diſtances between each ſucceſſively

Ship's Journal.

ceſſively. The true courſe between the places muſt be reduced to the courſe *per* compaſs, by allowing the variation to the right or left of the true courſe, according as it is weſt or eaſt.

At the time of leaving the land, the bearing of ſome known place is to be obſerved, and its diſtance is uſually found by eſtimation. As perhaps the diſtance thus found will be liable to ſome error, particularly in hazy or foggy weather, or when that diſtance is conſiderable, it will therefore be proper to uſe the following method for this purpoſe.

Let the bearing be obſerved of the place from which the departure is to be taken; and the ſhip having run a certain diſtance on a direct courſe, the bearing of the ſame place is to be again obſerved. Now having one ſide of a plane triangle, namely the diſtance ſailed and all the angles, the other diſtances may be found by Prob. I. of Oblique Sailing.

The method of finding the courſe and diſtance ſailed in a given time is by the compaſs, the log line, and half-minute-glaſs. Theſe have been already deſcribed In the royal navy, and in ſhips in the ſervice of the Eaſt India company, the log is hove once every hour; but in moſt other trading veſſels only every two hours.

The ſeveral courſes and diſtances ſailed in the courſe of 24 hours, or between noon and noon, and whatever remarks that are thought worthy of notice, are ſet down with chalk on a board painted black called the *log-board*, which is uſually divided into ſix columns: the firſt column on the left hand contains the hours from noon to noon; the ſecond and third the knots and parts of a knot ſailed every hour, or every two hours, according as the log is marked; the fourth column contains the courſes ſteered; the fifth the winds; and in the ſixth the various remarks and phenomena are written. The log-board is tranſcriber every day at noon into the log-book, which is ruled and divided after the ſame manner.

The courſes ſteered muſt be corrected by the variation of the compaſs and leeway. If the variation is weſt, it muſt be allowed to the left hand of the courſe ſteered: but if eaſt, to the right hand in order to obtain the true courſe. The leeway is to be allowed to the right or left of the courſe ſteered according as the ſhip is on the larboard or ſtarboard tack. The method of finding the variation, which ſhould be determined daily if poſſible, is given in the preceding chapter; and the leeway may be underſtood from what follows.

When a ſhip is cloſe hauled, that part of the wind which acts upon the hull and rigging, together with a conſiderable part of the force which is exerted on the ſails, tends to drive her to the leeward. But ſince the bow of a ſhip expoſes leſs ſurface to the water than her ſide, the reſiſtance will be leſs in the firſt caſe than in the ſecond: the velocity in the direction of her head will therefore in moſt caſes be greater than the velocity in the direction of her ſide; and the ſhip's real courſe will between the two directions. The angle formed between the line of her apparent courſe and the line ſhe really deſcribes through the water is called the *angle of leeway*, or ſimply the *leeway*.

There are many circumſtances which prevent the laying down rules for the allowance of leeway. The conſtruction of different veſſels, their trim with regard to the nature and quantity of their cargo, the poſition and magnitude of the ſail ſet, and the velocity of the ſhip, together with the ſwell of the ſea, are all ſuſceptible of great variation, and very much affect the leeway, The following rules are, however, uſually given for this purpoſe,

1. When a ſhip is cloſe hauled, has all her ſails ſet, the water ſmooth, with a little breeze of wind, ſhe is then ſuppoſed to make little or no leeway.

2. Allow one point when the top gallant ſails are handed.

3. Allow two points when under cloſe reefed top-ſails.

4. Allow two points and an half when one topſail is handed.

5. Allow three points and an half when both top-ſails are handed.

6. Allow four points when the fore-courſe is handed.
7. Allow five points when under the mainſail only.
8. Allow ſix points when under-balanced mizen.
6. Allow ſeven points when under bare poles.

Theſe allowances may be of ſome uſe to work up the day's works of a journal which has been neglected, but a prudent navigator will never be guilty of this neglect. A very good method of eſtimating the leeway is to obſerve the bearing of the ſhip's wake as frequently as may be judged neceſſary; which may be conveniently enough done by drawing a ſmall ſemicircle on the tafferal, with its diameter at right angles to the ſhip's length, and dividing its circumference into points and quarters. The angle contained between the ſemidiameter which points right aft and that which points in the direction of the wake is the leeway. But the beſt and moſt rational way of bringing the leeway into the day's log is to have a compaſs or ſemicircle on the tafferal, as before deſcribed, with a low crutch or ſwivel in its centre; after heaving the log, the line may be ſlipped into the crutch juſt before it is drawn in, and the angle it makes on the limb with the line drawn right aft will ſhow the leeway very accurately: which as a neceſſary article, ought to be entered into a ſeparate column againſt the hourly diſtance on the log-board.

In hard blowing weather, with a contrary wind and a high ſea, it is impoſſible to gain any advantage by ſailing. In ſuch caſes, therefore, the object is to avoid as much as poſſible being driven back. With this intention it is uſual to lie to under no more ſail than is ſufficient to prevent the violent rolling which the veſſel would otherwiſe acquire, to the endangering her maſts, and ſtraining her timbers, &c. When a ſhip is brought to, the tiller is put cloſe over to the leeward, which brings her head round to the wind. The wind having then very little power on the ſails, the ſhip loſes her way through the water; which ceaſing to act on the rudder, her head falls off from the wind, the ſail which ſhe has ſet fills, and gives her freſh way through the water; which acting on the rudder brings her head again to the wind. Thus the ſhip has a kind of vibratory motion, coming up to the wind and falling off from it again alternately. Now the middle point between thoſe upon which ſhe comes up and falls off is taken for her apparent course: and the leeway and variation is to be allowed from thence to find the true course.

The setting and drift of currents, and the heave of the sea, are to be marked down. These are to be corrected by variation only.

The computation made from the several courses, corrected as above, and their corresponding distances, is called a *day's work*; and the ship's place, as deduced therefrom, is called her place by *account*, or *dead-reckoning*.

It is almost constantly found that the latitude by account does not agree with that by observation. From an attentive consideration of the nature and form of the common log, that its place is alterable by the weight of the line, by currents, and other causes, and also the errors to which the course is liable, from the very often wrong position of the compass in the binnacle, the variation not being well ascertained, an exact agreement of the latitudes cannot be expected.

When the difference of longitude is to be found by dead reckoning, if then the latitudes by account and observation disagree, several writers on navigation have proposed to apply a conjectural correction to the departure or difference of longitude. Thus, if the course be near the meridian, the error is wholly attributed to the distance, and the departure is to be increased or diminished accordingly; if near the parallel, the course only is supposed to be erroneous; and if the course is towards the middle of the quadrant, the course and distance are both assumed wrong. This last correction will, according to different authors, place the ship upon opposite sides of her meridian, by account. As these corrections are, therefore, no better than guessing, they should be absolutely rejected.

If the latitudes are not found to agree, the navigator ought to examine his log-line and half-minute-glass, and correct the distance accordingly. He is then to consider if the variation and leeway have been properly ascertained; if not, the courses are to be again corrected, and no other alteration whatever is to be made on them. He is next to observe if the ship's place has been affected by a curent or heave of the sea, and to allow for them according to the best of his judgement. By applying these corrections, the latitudes will generally be found to agree tolerably well; and the longitude is not to receive any farther alteration.

It will be proper, however, for the navigator to determine the longitude of the ship from observation as often as possible; and the reckoning is to be carried forward in the usual manner from the last good observation; yet it will perhaps be very satisfactory to keep a separate account of the longitude by dead-reckoning.

General Rule for working a Day's Work.

Correct the several courses for variation and leeway; place them, and the corresponding distances, in a table prepared for that purpose. From whence, by Traverse Sailing, find the difference of latitude and departure made good: hence the corresponding course and distance, and the ships present latitude, will be known.

Find the middle latitude at the top or bottom of the Traverse Table, and the distance answering to the departure found in a latitude column, will be the difference of longitude; Or, the departure answering to the course made good, and the meridional difference of latitude in a latitude column, is the difference of longitude. The sum, or difference of which, and the longitude left, according as they are of the same or of a contrary name, will be the ship's present longitude of the same name with the greater.

Compute the difference of latitude between the ship and the intended port, or any other place whose bearing and distance may be required; find also the meridional difference of latitude and the difference of longitude. Now the course answering the meridional difference of latitude found in a latitude column, and the difference of longitude in a departure column, will be the bearing of the place, and the distance answering to the difference of latitude will be the distance of the ship from the proposed place. If these numbers exceed the limits of the Table, it will be necessary to take aliquot parts of them: and the distance is to be multiplied by the number by which the difference of latitude is divided.

It will sometimes be necessary to keep an account of the meridian distance, especially in the Baltic or Mediterranean trade, where charts are used in which the longitude is not marked. The meridian distance on the first day is that day's departure: and any other day it is equal to the sum or difference of the preceding day's meridian distance and the day's departure, according as they are of the same or of a contrary denomination.

A JOURNAL of a VOYAGE from London to Funchal in Madeira, in his Majeſty's Ship the Reſolution, A—— M—— Commander, *anno* 1793.

Day of Month.	Winds.	Remarks on board his Majeſty's Ship Reſolution, 1793.
♄ Sept. 28.	SW.	Strong gales and heavy rain. At 3 P. M. ſent down top-gallant-yards; at 11 A. M. the pilot came on board.
☉ Sept. 29.	SW.	Moderate and cloudy, with rain. At 10 A. M. caſt looſe from the ſheer hulk at Deptford; got up top-gallant yards and made ſail down the river. At noon running through Blackwall reach.
☽ Sept. 30.	SW. Variable.	The firſt part moderate, the latter ſqually with rain. At half paſt one anchored at the Galleons, and moored ſhip with near a whole cable each way in 5 fathoms, a quarter of a mile off ſhore. At 3 A. M. ſtrong gales: got down top-gallant yards. A. M. the people employed working up junk. Bent the ſheet cable.
♂ Octob. 1.	SSW. SW.	Freſh gales and ſqually. P. M. received the remainder of the boatſwain's and carpenter's ſtores on board. The clerk of the cheque muſtered the ſhip's company.
☿ October 2.	Variable. N*b*E.	Variable weather, with rain. At noon weighed and made ſail; at 5 anchored in Long-reach in 8 fathoms. Received the powder on board. At 6 A. M. weighed and got down the river. At 10 A. M. paſt the Nore; brought to and hoiſted in the boats; double reefed the topſails, and made ſail for the Downs. At noon running for the flats of Margate.
♃ Octob. 3.	N*b*E. N.	Firſt part ſtormy weather; latter moderate and clear. At 4 P. M. got through Margate Roads. At 5 run through the Downs; and at 6 anchored in Dover-road, in 10 fathoms muddy ground. Dover Caſtle bore north, and the ſouth Foreland NE*b*E½E off ſhore 1½ miles. Diſcharged the pilot. Employed making points, &c. for the ſails. Scaled the guns.
♀ Octob. 4.	N. NNE.	Moderate and fair. Employed working up junk. Received from Deal a cutter of 17 feet, with materials. A. M. ſtrong gales and ſqually, with rain; got down top-gallant yards.

Hours.	Kn.	Fa	Courſes.	Winds.	Remarks, ♄ October 5, 1793.
1				NNE.	Freſh gales with rain.
2					Hove ſhort.
3					Weighed and made ſail.
4	4				
5	6		WSW.		
6	7				
7	7				
8	7				Shortened ſail.—Dungeneſs light NE*b*E.
9	6	4	W*b*N.	NE.	
10	6				
11	6				
12	6				Freſh breezes, and cloudy.
1	6				
2	6				
3	6				
4	6				Ditto weather.
5	6				
6	6				Got up top-gallant yards.
7	6				Set ſtudding ſails.
8	7				Ditto weather.
9	7	5			
10	7	5			
11	7	6			
12	8				St Alban's Head N¼E.

Ship's Journal.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ☉ October 6, 1793.
1	8		W*b*N.	NE.	A freſh ſteady gale.
2	8				
3	8				
4	8				Do. weather.
5	8				Spoke the Ranger of London, from Carolina.
6	8				Took in ſtudding ſails.
7	8				
8	8				Do. weather.
9	8				
10	8				
11	8				Eddiſtone light N*b*W.
12	8				Do. weather.
1	8				Eddiſtone light NE.
2	7	5			
3	7	5			
4	7				Do. weather.
5	7		W*b*S.		
6	7				Set lower ſtudding ſails.
7	7	4			
8	7	6			Freſh breeze and clear weather.
9	7	3			
10	7	5			
11	7	2			
12	7				Do. weather.

Courſe.	Diſt.	D.L	Dep.	N. Latitude by		D. Long.	W. Long. by		W. Var. obſ.		
				Acc.	Obſ.		Acc.	Obſ.			
S 52° ½ W.	93	57	74	49° 11	49° 9′	114 W.	6° 18′		2¼ points.		

As there is no land in ſight this day at noon, and from the courſe and diſtance run ſince the laſt bearing of the Eddiſtone light was taken, it is not to be ſuppoſed that any part of England will be ſeen, the departure is therefore taken from the Eddiſtone; and the diſtance of the ſhip from that place is found by reſolving an oblique angled plane triangle, in which all the angles are given, and one ſide, namely, the diſtance run (16 miles) between the obſervations. Hence the diſtance from the Eddiſtone at the time the laſt bearing of the light was taken will be found equal to 18 miles; and as the bearing of the Eddiſtone from the ſhip at that time was NE, the ſhip's bearing from the Eddiſtone was SE.. Now the variation 2¼ points W. being allowed to the left of SW. gives S*b*W¾W, the true courſe. The other courſes are in like manner to be corrected, and inſerted in the following table, together with their reſpective diſtances, beginning at 10 o'clock A. M. the time when the laſt bearing of the Eddiſtone was taken. The difference of latitude, departure, courſe, and diſtance, made good, are to be found by Traverſe Sailing.

Courſes.	Diſt.	Diff. of Latitude.		Departure.	
		N.	S.	E.	W.
S*b*W¾W.	18		17.0		6.1
W*b*S¼S.	22		5.3		21.3
SW¾W.	58		34.6		46.6
S 52°½W.	93		56.9 = 57m.		74.0

Latitude of Eddiſtone - 50° 8′ N.

Latitude by account - 49 11. N.
Sum - - - 99 19
Middle latitude - - 49 40

Now to middle latitude as a courſe, and the departure 74m. in a latitude column, the difference of longitude in a diſtance column is 114 = 1° 54 W.
Longitude of Eddiſtone - 4 24 W.

Longitude in by account - 6 18 W.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ☽ October 7. 1793.
1	6	5	WSW.	NE.	Freſh breezes.
2	6	5			Sounded 62 ; fine ſand.
3	6				
4	5	3			Moderate and cloudy.
5	5				Unbent the cables, and coiled them.
6	5			N.	Took in ſtudding ſails.
7	5				
8	4	7			Do weather.
9	4	5			
10	4	5			
11	4				
12	4				Do. weather
1	4				
2	4				
3	4				
4	4				Light breeze.
5	3		SW*b*W.	NW.	
6	3				A ſail S*b*E.
7	3				
8	3				Hazy weather.
9	3		SW.	Var.	
10	3				
11	3				
12	2				Do. weather.

Courſe.	Diſt.	D.L.	Dep	N. Latitude by		D. Long.	W. Long. by		W. Var. by ac.	Porto Sancto's	
				Acc.	Obſ.		Acc.	Obſ.		Bearing.	Diſtance.
S 38° W.	99	78	62	47° 51′		93′W.	7° 51′		2¼ pts.	S 23°¾W.	974 m.

The courſes being corrected for variation, and the diſtances ſummed up, the work will be as under.

Courſes.	Diſt.	Diff. of Latitude.		Departure.	
		N.	S.	E.	W.
SW¼S.	77		57.0		51.7
SSW¾W.	12		10.3		6.2
S*b*W¾W.	11		10.4		3.7
S 38°W.	99		77.7		61.6

1° 18′
Yeſterday's lat by obſer. = 49 9N.
Latitude by account = 47 51N.
Sum - - 97 0
Middle latitude - 48 30

To middle latitude 48½°, and departure 61.6 in a latitude column, the correſponding difference of longitude in a diſtance column is 93′ - - = 1° 33W.
Yeſterday's longitude 6 18W.
Longitude in by account 7 51W.

It is now neceſſary to find the bearing and diſtance of the intended port, namely Funchal ; but as that place is on the oppoſite ſide of the iſland with reſpect to the ſhip, it is therefore more proper to find the bearing of the eaſt or weſt end of Madeira ; the eaſt end is, however, preferable. But as the ſmall iſland of Porto Sancto lies a little to the NE of the eaſt end of Madeira, it therefore ſeems more eligible to find the bearing and diſtance of that iſland.

To find the bearing and diſtance of Porto Sancto.

Latitude of ſhip	47° 51N.	Mer. parts	3278	Longitude of ſhip	7° 51W.
Lat. of Porto Sancto	32 58N.	Mer. parts	2097	Lon. Porto Sancto	16 25W.
Difference of latitude	14 53=893	M D. lat	1181	Difference of long.	8 34=514

The courſe anſwering to the meridional difference of latitude and difference of longitude is about 23¾°, and the diſtance correſponding to the difference of latitude is 974 miles. Now as Porto Sancto lies to the ſouthward and weſtward of the ſhip, the courſe is therefore S 23¾°W ; and the variation, becauſe weſt being allowed to the right hand, gives SW¼W nearly, the bearing *per* compaſs ; and which is the courſe that ought to be ſteered.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	W inds.	Remarks, ♂ October 8, 1793.
1	2		SW.	NW.	Little wind and cloudy.
2	1			Variable.	
3					Tried the current and found none.
4			Ship's head to the SW.		Calm.
5					
6					
7					Calm ; a long ſwell from the SW.
8			Ship's head from SW to SSE.		
9					
10	1		WSW.	S.	
11	1				
12	2				Light airs and hazy.
1	2				
2	2				
3	2				
4	3				Moderate wind and cloudy.
5	3		W.	S*b*W.	
6	4				Set top-gallant ſails.
7	5				
8	5				
9	5				
10	5		W$\frac{1}{2}$N.	SSW.	
11	5				By double altitudes of the ſun the latitude was found to be 47° 28′ N.
12	5				

Courſe.	Diſt.	D.L.	Dep.	N. Latitude by Acc.	N. Latitude by Obſ.	D. Long.	W. Long. by Acc.	W. Long. by Obſ.	W. Var.	Porto Sancto's Bearing.	Porto Sancto's Diſt ance.
S 61° W.	51	25	45	47° 26′	47° 28′	67′ W.	8 58′		2 points.	S 21° W.	932

The ſeveral courſes corrected will be as under.

Courſes.	Diſt.	Diff. of Latitude N.	Diff. of Latitude S.	Departure. E.	Departure. W.
SSW.	3		2.8		1.1
SW.	13		9.2		9.2
WSW.	22		8.4		20.3
W*b*S$\frac{1}{2}$S.	15		4.4		14.4
S 61° W.	51		24.8 = 25		45.0

Yeſterday's latitude 47 51

Latitude by account - 47 26
Sum - - 77
Middle latitude - - 47 39

To middle latitude $47^\circ\frac{2}{3}$, and departure 45′ in a latitude column, the difference of longitude in a diſtance column is 67′ = 1° 7W.
Yeſterday's longitude 7 51W

Longitude in by account 8 58W

To find the bearing and diſtance of Porto Sancto.

Latitude of ſhip	47° 28 N.	Mer. parts	3244	Longitude	8° 58 W.
Lat. of Porto Sancto	32 58 N.	Mer. parts	2097	Longitude	16 25 W.
Difference of latitude	14 30 = 870	M. D. lat.	1147	D. longitude	7 27=447′

Hence the bearing of Porto Sancto is S. 21° W, and diſtance 932 miles. The courſe per compaſs is therefore S. W. nearly.

A Journal from England to Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ☿ October 9, 1793.
1	5		W*b*N.	SW*b*S.	Squally with rain.
2	5				Handed top-gallant ſails.
3	5	5			In 1ſt reef topſails.
4	5	4			Dark gloomy weather. Tacked ſhip.
5	5	6	SE*b*S.		
6	5				In 2d reef top-ſails, and down top-gallant yards.
7	4				
8	4				Stormy weather; in fore and mizen topſails and 3d reef maintop ſail. Handed the maintop ſail, bent the main-ſtay ſail, and brought to with it and the mizen; reefed the mainſail, at 10, wore and lay to under the mainſail, got down top-gallant maſts; at 12 ſet the foreſail, and balanced the mizen.
9	3				
10			up SE*b*S. off ESE.		
11	}		upWSW off WNW.		
12					
1	3		W*b*N.		
2	3	6			
3	3	5	WNW.	SW.	The ſea ſtove in ſeveral half ports.
4	3	5			
5	4				The ſwell abates a little.
6	4		W*b*N.	SW*b*S.	
7	3	2			The ſwell abates faſt.
8	3	4			Up top-gallant-maſts.
9	3	4	W.	SSW.	
10	4				Set the topſails.
11	5				
12	5				Clear weather; good obſervation.

Courſe.	Diſt.	D L	Dep.	N. Latitude by Acc.	N. Latitude by Obſ.	D. Long.	W. Long by Acc.	W. Long by Obſ.	W. Var.	Porto Sancto's Bearing	Porto Sancto's Diſtance.
W*b*N½N.	43	12	41	47° 40	47° 39	61′	9° 59′		2 points.		

There is no leeway allowed until 2 o'clock P. M. when the top-gallant ſails are taken in; from 2 to 3 one point is allowed; from 3 to 6, one and a half points are allowed; from 6 to 8 one and three-fourth points are allowed: from 8 to 9, three points; from nine to 10 four and an half points; from 10 to 12, five points; from 12 to 10 A. M. three and an half points; and from thence to noon two points leeway are allowed. Now the ſeveral courſes being corrected by variation and leeway will be as under; but as the corrected courſes from 2 to 3 P M. and from 10 to 12 A M are the ſame, namely, weſt; this, therefore, is inſerted in the table, together with the ſum of the diſtances, as a ſingle courſe and diſtance. In like manner the courſes from 12 to 2, and from 5 to 8 being the ſame, are inſerted as a ſingle courſe and diſtance.

Courſes.	Diſt.	Diff. of Latitude. N.	Diff. of Latitude. S.	Departure. E.	Departure. W.
W*b*S.	10		20.0		9.8
W.	15.5				15.5
W½N.	5 4	0.5			5.4
E*b*S½S.	10.6		3.1	10.1	
E*b*S¼S.	8		1.9	7.8	
E.	3			3.0	
NE*b*E.	1	0.6		0.8	
NW*b*W.	2	1.1			1.7
NW*b*W½W.	17.2	8.1			15.2
NW½W.	11	7 0			8.5
W*b*N½N.	7.4	2.1			7.1
		19.4	7.0	21.7	63 2
		7.0			21.7
W*b*N½N.	43	1 4			41.5

Yeſt. latitude 47 28 N.
Lat. by account 47 40 N.
To middle latitude 47° 34′, and departure 41.5 the difference of longitude is - 61 = 1° 1′ W.
Yeſterday's longitude - 8 58 W.
Longitude in by accoant 9 59 W.

Ship's Journal.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ♃ October 9, 1793.
1	5	3	W.	SSW.	Freſh gales with rain.
2	5	7			
3	6				
4	6				Do. weather.
5	6				Out 3d reef topſails.
6	6				Loſt a log and line.
7	5	6			
8	5	4			Do. weather.
9	5	5			
10	5	2			
11	5				
12	5				Do. weather.
1	5	5			
2	5				
3	5				
4	4				Moderate and cloudy, out all reefs.
5	4		WSW.	S	
6	4				Sprung fore top-gallant yard, got up another.
7	4	3			
8	4	4	SW*b*W.	SSE.	Do weather.
9	4	6			A ſail NE.
10	5	3			Employed working up junk.
11	5	4		SE*b*S.	A ſwell from the NW, which by eſtimation has
12	5				ſet ſhip 7 miles in the oppoſite direction.

Courſe.	Diſt.	D.L.	Dep.	N. Latitude by Acc.	N. Latitude by Obſ.	D. Long.	W. Long. by Acc.	W. Long. by Obſ.	W. Var.	Porto Sancto's Bearing.	Porto Sancto's Diſtance.
S 74° W	108	30	104	47° 9′		153 W.	12° 32		2 Point.	S 12° W.	870 m.

Ship's Journal.

Two points leeway are allowed on the firſt courſe, one on the ſecond; and as the ſhip is 7 points from the wind on the third courſe, there is no leeway allowed on it. The oppoſite point to NW, that from which the ſwell ſet, with the variation allowed upon it, is the laſt courſe in the Traverſe Table.

Courſes.	Diſt.	Diff. of Latitude. N.	Diff. of Latitude. S.	Departure. E.	Departure. W.
W.	86.2				86.2
SW*b*W.	12.3		6.8		10.2
SW*b*S.	24.7		20.5		13.7
ESE.	7		2.7	6.5	
S 74 W.	108		30.0	6.5	110.1
					6.5
					103.6

Yeſterday's latitude 47 39
Latitude by account 47 9
Sum 48
Middle latitude 47 24

To middle latitude 47 24, and departure 103.6, the difference of longitude is 153′ = 2° 33 W.
Yeſterday's longitude - 9 59 W.
Longitude in - - 12 32 W.

To find the bearing and diſtance of Porto Sancto.

Latitude of ſhip	-	47° 9′ Mer. parts	-	3216	Longitude	-	12° 32′ W.
Lat. Porto Sancto	-	32 58 Mer. parts	-	2097	Longitude	-	16 25 W.
Difference of latitude		14 11=851′ M. D. lat.		1119	D. longitude	-	3 53=233.

Hence the bearing of Porto Sancto is S 12° W. and diſtance 870 miles; the courſe *per* compaſs is therefore about SW*b*W.

Ship's Journal.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ♀ October 11, 1793.
1	4		SW*b*S.	ESE.	Moderate wind and fair weather.
2	3				Shortened ſail and ſet up the topmaſt rigging.
3	2				
4	3				Do. weather.
5	4				Variation *per* amplitude 21° W.
6	4	6			
7	4	4			
8	4	5			A fine ſteady breeze.
9	5			E.	By an obſervation of the moon's diſtance from
10	5				α Pegaſi, the ſhip's longitude at half paſt 8 was
11	5				12° 28′ W.
12	5	2			Clear weather.
1	5	7			
2	6				
3	6			ENE.	
4	6				Do weather.
5	6	2			
6	6				
7	6	3			
8	6				Set ſtudding ſails, &c.
9	7				
10	7				One ſail in ſight.
11	8				
12	8				Do. weather, good obſervation.

Courſe.	Diſt.	D.L.	Dep.	N. Latitude by		D. Long.	W. Long. by		W. Var.	Porto Sancto's	
				Acc.	Obſ.		Acc.	Obſ.	Obſ.	Bearing.	Diſtance.
S 12° 45′ W.	128	125	28	45° 4′	44° 59′	41′ W.	13° 13′	12° 59′	21°	S 12° W.	737 m.

The obſerved variation S 21° being allowed to the left of SW*b*S. gives 12° 45′ W, the corrected courſe and the diſtance ſummed up is 127.9, or 128 miles. Hence the difference of latitude is 124.8, and the departure 28.2. The latitude by account is therefore 45° 4′ N, and the middle latitude 46° 6′, to which, and the departure 28.2: in a latitude column, the difference of longitude in a diſtance column is 41′ W; which being added to 12° 32′ W, the yeſterday's longitude, gives 13° 13′ W, the longitude in by account. But the longitude by obſervation was 12° 28′ W. at half paſt 8 P. M.; ſince that time the ſhip has run 96 miles; hence the departure in that interval is 21.2 m. Now half the difference of latitude 47 m. added to 44° 59′, the latitude by obſervation at noon, the ſum 45° 46′ is the middle latitude; with which and the departure 21.2, the difference of longitude is found to be 31′ W; which therefore added to 12° 28′, the longitude obſerved, the ſum is 12° 59′ W, the longitude by obſervation reduced to noon.

To find the bearing and diſtance of Porto Sancto.

Latitude ſhip	44° 59′ N.	Mer. parts	3028	Longitude	12° 59′ W.
Lat. of Porto Sancto	32 58 N.	Mer. parts	2097	Longitude	16 25 W.
Difference latitude	12 1 = 721	M. D. lat.	931	D. longitude	3 26 = 206′

Hence the bearing of Porto Sancto is S. 12° W, and diſtance 737 miles. The courſe to be ſteered is therefore S 33° W, or SW*b*W. nearly.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ♄ October 12, 1793.
1	8		SW*b*S.	E*b*N.	Freſh gales, and cloudy.
2	7	5			
3	8				
4	8	6			Do. weather.
5	8	4			
6	8				Hauled down ſtudding-ſails.
7	7	5			
8	7	3			Do. weather.
9	7	4			
10	7	2			
11	7	6			
12	7	5		ENE.	A ſteady gale and fine weather.
1	7				
2	7	5			
3	7				
4	7	3			Do. weather.
5	7	2			
6	7				
7	7	4			Out ſtudding ſails alow and aloft.
8	8				Variation *per* azimuth 20° 14' W.
9	8				A ſail in the SW. quarter.
10	8				
11	7	6			Sailmaker altering a lower ſtudding-ſail.
12	8				Fine weather, and cloudy.

Courſe.	Diſt.	D.L	Dep.	N. Latitude by		D. Long.	W. Long. by		W. Var.	Porto Sancto's	
				Acc.	Obſ.		Acc.	Obſ.	Obſ.	Bearing.	Diſtance.
S 13° 31' W.	183	178	43	42° 1'		59 W.	14° 12'	13° 58'	20° 14'	S 12° W.	555 m.

The courſe corrected by variation is S 13° 31' W, and the diſtance run is 113 miles: hence the difference of latitude is 177.9, and the departure 42.8.

Yeſterday's latitude by obſervation	-	44° 59' N.	Mer. parts - - -	3028
Difference of latitude - -	-	2 58 S.		
Latitude in by account	- -	42 1 N.	Mer. parts - -	2783
Meridional difference of latitude	- -		- -	245

Now to courſe 13°½, and meridional difference of latitude 245 in a latitude column, the difference of longitude in a departure column is 59' W: hence the yeſterday's longitudes by account and obſervation, reduced to the noon of this day, will be 14° 12' W. and 13° 58' reſpectively.

To find the bearing and diſtance of Porto Sancto.

Latitude ſhip -	42° 1' N.	Mer. parts -	2783	Longitude -	13° 58 W.
Lat. Porto Sancto	32 58 N.	Mer. parts -	2097	Longitude -	16 25 W.
Difference of latitude	9 3=543'	M. D. latitude -	686	D. longitude	2 27=147.

The meridional difference of latitude and difference of longitude will be found to agree neareſt under 12°, the correct bearing of Porto Sancto; and the variation being allowed to the right hand of S. 12° W, gives S 32¼ W, the bearing *per* compaſs; and the diſtance anſwering to the difference of latitude 543, under 12 degrees, is 555 miles.

Ship's Journal.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ⊙ October 13, 1793.
1	8		SW*b*S.	ENE.	A ſteady gale, and fine weather.
2	8	5			
3	8	6			At 34 minutes paſt three, the diſtance between the neareſt limbs of the ſun and moon, together with the altitude of each, were obſerved; from whence the ſhip's longitude at that time is 14° 1′ W.
4	8				
5	8				
6	8	4			
7	8				
8	7	5			Hauled in the lower ſtudding-ſails.
9	7				At 9h 22, by an obſervation of the moon's diſtance from α Pegaſi, the longitude was 14° 20 W.
10	7				
11	7				
12	7				Freſh gales, and clear.
1	7				
2	8			ESE.	
3	7				
4	7				Do. weather.
5	7				
6	7				
7	8				Variation *per* amplitude 19° 51 W.
8	8				Do. *per* azimuth 19° 28′ W. Set ſtudding-ſails.
9	8	4			
10	8	2			Carried away a fore-top-maſt ſtudding ſail boom, got up another.
11	8				
12	7	4			Freſh gales. Took in ſtudding-ſails.

Courſe.	Diſt.	D.L.	Dep.	N. Latitude by		D. Long.	W. Long. by		W. Var. by obſ.	Porto Sancto's	
				Acc.	Obſ.		Acc.	Obſ.		Bearing.	Diſtance.
S*b*W¼W.	184	178	45	39° 3′		59′W.	15° 11′	14° 52′	1¾ pts.		

The mean of the variations is about 1¾points W: hence the courſe corrected is S*b*W¼W; with which and the diſtance run 184 miles, the difference of latitude is 178.5, and the departure 44.7.

Yeſterday's latitude - - 42° 1′ N. Mer. parts - - 2783
Difference of latitude - - 2 58 S.

Latitude in by account - 39 3 N. Mer. parts - - 2549

Meridional difference of latitude - - - - - 234

Now, to courſe 1¼ points, and meridional difference of latitude is 234, the difference of longitude is about 59 m.: which, added to the yeſterday's longitude by account 14° 12′ W, the ſum 15° 11′ W. is the longitude in by account at noon. The longitudes by obſervation are reduced to noon as follow:

The diſtance run between noon and 3h 34′ P. M. is 29 miles; to which, and the courſe 1¼ points, the difference of latitude is - - 28′
Yeſterday's latitude at noon - - 42 1 N.

Latitude at time of obſervation - 41 33 N. Mer. parts - - 2746
Latitude at noon - - 39 3 N. Mer. parts - - 2549

Meridional difference of latitude - - - - - 197

Then, to courſe 1¼ points, and meridional difference of latitude 197 in a latitude column, the difference of longitude in a departure column is 49′ W; which added to 14° 1′ W, the longitude by obſervation, the ſum 14° 50′ W. is the longitude reduced to noon.

Again, the diſtance run between the preceding noon and 9h 22′ P. M. is 75 miles: hence the correſponding difference of latitude is 72.8, or 73 miles; the ſhip's latitude at that time is therefore 40° 48′ N.

Latitude at time of obſervation - 40° 48′ N. Mer. parts - - - 2686
Latitude at noon - - 39 3 N. Mer. parts - - - 2549

Meridional difference of latitude - - - - - 1[illegible]

Now with the corrected courſe, and meridional difference of latitude the difference of longitude is 34′ W; which added to 14° 20′ W, the ſum is 14° 54′ W, the reduced longitude. The mean of which and the former reduced longitude is 14° 52 W, the correct longitude.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ☽ October 14, 1793.
1	8		SW*b*S.	E*b*S.	Freſh gales and hazy, ſingle reefed top-ſails.
2	7	5			
3	7	5			Got down top-gallant yards.
4	7				Do. weather, and a confuſed ſwell running.
5	7	4	SSW.		
6	7	1			
7	7				
8	6	5			More moderate.
9	6			Variable.	
10	5				
11	5				
12	4				Do. with lightning all round the compaſs.
1	3				
2	3				
3	3	5	SW*b*S.	SE*b*S.	
4	4				Squally with rain.
5	5				
6	4				
7	2	5			
8	2		SW.	SSE.	Moderate weather; out reefs, and up top-gallant-yards.
9	3				
10	3	5			
11	4	5	WSW.	S.	At 11h 10′ A. M. the latitude from double altitudes of the ſun was 37° 10′. Clear weather.
12	5				

Courſe.	Diſt.	D.L	Dep.	N. Latitude by Acc.	N. Latitude by Obſ.	D. Long.	W. Long. by Acc.	W. Long. by Obſ.	W. Var. obſ	Porto Sancto's Bearing	Porto Sancto's Diſtance.
S 16° W.	116	111	32	37° 12	37° 8	41′ W.	15° 52	15° 33	1¾ points.	S 10° W.	254 m.

As the ſhip is cloſe hauled from 2 o'clock A. M. 1¾ points leeway are allowed upon that courſe, and 1 point on the two following courſes.

Courſes.	Diſt.	Diff. of Latitude N.	Diff. of Latitude S.	Departure. E.	Departure. W.
S*b*W¼W.	30		29.1		7.3
S¼W.	54		53.9		2.7
SSW½W.	19		16.8		9.0
SW¾S.	8.5		6.8		5.1
SW*b*W¼W.	9.5		4.9		8.1
S 16° W.	116		111.5=1° 51′		32.2

Yeſterday's latitude	39° 3′	M. lat. 38° 7′
Latitude in by account	37 12	

To middle latitude 38°, and departure 32.2 in a latitude column, the difference of longitude in a diſtance column, is 41

	by account	by obſ.
Yeſterday's long. by account	15° 11′ W.	14° 52′ W.
Difference of longitude	41 W.	41 W.
Longitude in	15 22	15 33 W.

The latitude by obſervation at 11h 10′ A. M. is 37° 10′, and from that time till noon the ſhip has run about 4 miles. Hence the correſponding difference of latitude is 2 miles, which ſubtracted from the latitude obſerved, gives 37° 8′, the latitude reduced to noon.

To find the bearing and diſtance of Porto Sancto.

Latitude of ſhip	37° 8′ N. Mer. parts	2403	Longitude	15° 33′ W.
Lat. of Porto Sancto	32 58 N. Mer. parts	2097	Longitude	16 25 W.
Difference of latitude	4 10=250 M. D. Lat.	306	Diff. Long.	52

Hence the bearing of Porto Sancto is S 10° W, or SSW¾W. nearly, *per* compaſs, and the diſtance is 254 miles.

A Journal

Ship's Journal.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ♂ October 15, 1793.
1	4		W*b*S.	S*b*W.	Moderate and clear weather.
2	4				
3	3	6			Employed working points and rope-bands.
4	3				Do. weather.
5	3	4			
6	3		W*b*N.	SW*b*S.	
7	3				
8	3	2			Fine clear weather.
9	4				
10	4				
11	3	5			
12	3	3		Variable.	Do. weather.
1	3				
2	4		W.		
3	3				
4	2		WNW.		
5	2	4	NW*b*W.	SW*b*W.	
6	3				
7	3				Variation per mean of ſeveral azimuths 18° 0′ W.
8	3	6			Do. weather. Tacked ſhip.
9	4		S*b*E.		
10	5				Sailmakers making wind-ſails.
11	5	4			
12	5	6			A fine ſteady breeze. Cloudy.

Courſe.	Diſt.	D.L	Dep.	N. Latitude by Acc.	N. Latitude by Obſ.	D. Long.	W. Long. by Acc.	W. Long. by Obſ.	W. Var. Obſ.	Porto Sancto's Bearing.	Porto Sancto's Diſtance.
S 68° W.	56	21	52	36° 47′		65′ W.	16° 57	16° 38′	18°	S¼E.	229 m.

Half a point of leeway is allowed on each courſe; but as the variation is expreſſed in degrees, it will be more convenient and accurate to reduce the ſeveral courſes into one, leeway only being allowed upon them. The courſe thus found is then to be corrected for variation, with which and the diſtance made good the difference of latitude and departure are to be found.

Courſes.	Diſt.	Diff. of Latitude. N.	Diff. of Latitude. S.	Departure. E.	Departure. W.
W½S.	18		1.8		17.9
W*b*N½N.	27	7.8			25.8
W½N.	7	0.7			7.0
NW*b*W½W.	2	0.9			1.8
NW½W.	12	7.6			9.3
S*b*E½E.	20		19.1	5.8	
		17.0	20.9	5.8	61.8
			17.0		5.8
S 86°W	56		3.9		56.0

Var. 18 W

Tr.cou.S68 W to which and the diſtance of 56 m. the difference of latitude is 21 m. and the departure 51.9 m. Hence the latitude in at noon is 36° 47′ W, and middle latitude 36° 58′, to which and the departure 51.9 in a latitude column, the difference of longitude in a diſtance column is 65° W.

Yeſterday's long. by acc.	15° 52′ W.	By obſ.	15° 33′ W.
Difference of longitude	1 5 W.		1 5 W.
Longitude in	16 57		16 38 W.

To find the bearing and diſtance of Porto Sancto.

Latitude ſhip	-	36° 47′ N.	Mer. parts	-	2376	Longitude	-	16° 38 W.
Lat. Porto Sancto		32 58 N.	Mer. parts	-	2097	Longitude	-	16 25 W.
Difference of latitude		3 49=229′	M. D. latitude	-	279	D. longitude		0 13

Hence the courſe is S¼E, diſtance 229 miles; and the courſe *per* compaſs is S*b*W½W. nearly.

Ship's Journal.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ☿ October 16, 1793.
1	6		SbE.	SWbW.	Freſh gales.
2	6	4			
3	7		S	W.	
4	7				Do. and cloudy.
5	7				
6	7	4			
7	7	6			
8	7				A ſteady freſh gale.
9	8		SbW.	NW.	
10	8				
11	8				
12	8				Do. weather.
1	8				
2	8				
3	8				
4	9				Do. weather.
5	9		SbW½W.		
6	9			N.	
7	9				Variation *per* amplitude 1½ points W.
8	8	5			
9	9				People employed occaſionally.
10	9			NEbE.	
11	7				
12	8				Do. weather. Obſerved ſun's meridian altitude.

Courſe.	Diſt.	D.L	Dep.	N. Latitude by Acc.	N. Latitude by Obſ.	D. Long.	W. Long. by Acc.	W. Long. by Obſ.	W. Var. obſ.	Porto Sancto's Bearing	Porto Sancto's Diſtance.
S 8° E.	186	1° 5′	26	33° 42	33° 46	31′ E.	16° 26	16° 7	1½ points.	S 17° W.	50 m.

Half a point of leeway is allowed on the firſt courſe; which and the others, are corrected for variation as uſual.

Courſes.	Diſt.	Diff. of Latitude. N.	Diff. of Latitude. S.	Departure. E.	Departure. W.
SEbS.	12.4		10.3	6.9	
SbE½E.	43.		41.2	12.5	
S½E.	65.		64.7	6.4	
S.	68.5		68.5		
S 8° E.	186		184.7	25.8	

	3° 5′
Yeſterday's latitude	36 47 N.
Latitude by account	33 42 N.
Sum	70 29
Middle latitude	35 15

To middle latitude and departure the difference of longitude in a diſtance column is 31′ E.

Yeſterday's longitude by acc.	16 57′ W.	by obſ.	16 38′ W.
Difference of longitude	-	0 31 E.	-	31 E.
Longitude in	-	16 26 W.	-	16 7 W.

To find the bearing and diſtance of Porto Sancto.

Latitude ſhip	33° 46′ N.	Mer. parts	2155	Longitude	16° 7′ W.
Lat. of Porto Sancto	32 58 N.	Mer. parts	2097	Longitude	16 25 W.
Difference of latitude	48	Mer. Diff. lat.	58	Diff. long.	0 18

Hence the bearing of Porto Sancto is S. 17° W. and diſtance 50 miles.

A Journal from England towards Madeira.

Hours.	Kn.	Fa.	Courſes.	Winds.	Remarks, ♃ October 17, 1793.
1	5		SSW.	NE*b*E.	Moderate wind and clear.
2	5				Saw the iſland of Porto Sancto, SW*b*S.
3	5		S.		Hauled up to round the eaſt end of Porto Sancto.
4	5				Bent the cables.
5	5				
6	6				
7	6				
8	7				Squally weather.
9	8		SW*b*S.		Porto Sancto W*b*S.
10	7				
11	7		SW*b*W.		
12	6				Do. with rain. Porto Sancto NE.
1	6		SW.		The Deſerters SW*b*S.
2	5				
3	6				
4	7				The Deſerters WSW. 3 or 4 leagues.
5	6				
6			Various.		Hauled up round the eaſt end of the Deſerters.
7					
8			NNW.		Violent ſqualls; clewed up all at times.
9			NW*b*N.		
10					Running into Funchal Roads.
11					
12					Anchored in Funchal Road, with the beſt bower in 30 fathom black ſand and mud. Brazen head E*b*S½S, Loo Rock NW, the Great Church NNE, and the ſouthernmoſt Deſerter SE½S; off ſhore two-thirds of a mile. Saluted the fort with 13 guns; returned by ditto. Found here his majeſty's ſhip Venus, and 7 Engliſh merchant ſhips.

This journal is performed by inſpection agreeable to the precepts given. Other methods might have been uſed for the ſame purpoſe; for which the two inſtruments already deſcribed and explained ſeem well adapted. We cannot, however, omit recommending the ſliding gunter, which will be found very expeditious, not only in performing a day's work, but alſo in reſolving moſt other nautical problems. See *Sliding-Gunter*.

It will be found very ſatisfactory to lay down the ſhip's place on a chart at the noon of each day, and her ſituation with reſpect to the place bound to, and the neareſt land will be obvious. The bearing and diſtance of the intended or any other port, and other requiſites may be eaſily found by the chart as already explained; and indeed, every day's work may be performed on the chart; and thus the uſe of tables ſuperſeded.

EXPLANATION OF THE TABLES.

TABLE I. *To reduce points of the compaſs to degrees, and converſely.*

The two firſt and two laſt columns of this table contain the ſeveral points and quarter-points of the compaſs; the third column contains the correſponding number of points and quarters; and the fourth, the degrees, &c. anſwering thereto. The manner of uſing this table is obvious.

TABLE II. *The miles and parts of a mile in a degree of longitude at every degree of latitude.*

The firſt column contains degrees of latitude, and the ſecond the correſponding miles in a degree of longitude; the other columns are a continuation of the firſt and ſecond. If the given latitude conſiſts of degrees and minutes, a proportional part of the difference between the miles anſwering to the given and following degrees of latitude is to be ſubtracted from the miles anſwering to the given degree.

EXAMPLE. Required the number of miles in a degree of longitude in latitude 57° 9'?

The difference between the miles anſwering to the latitudes of 57° and 58° is 0.89.

Then as 60' : 9' :: 0.89 : 0.13
Miles anſwering to 57° 32.68

Miles anſwering to 57° 9' 32.55

This Table may be uſed in parallel and Middle Latitude Sailing.

TABLE III. *Of the Sun's Semidiameter.*

This table contains the angle ſubtended by the ſun's ſemidiameter at the earth, for every fifth day of the year. The months and days are contained in the firſt column, and the ſemidiameter expreſſed in minutes and ſeconds in the ſecond column. It is uſeful in correct-ing

Explanation of the Tables.

ing altitudes of the ſun's limb, and diſtances between the ſun's limb and the moon.

TABLE IV. *Of the Refraction in Altitude.*

THE refraction is neceſſary for correcting altitudes and diſtances obſerved at ſea; it is always to be ſubtracted from the obſerved altitudes, or added to the zenith diſtance. This table is adapted to a mean ſtate of the atmoſphere in Britain, namely to 29.6 inches of the barometer, and 50° of the thermometer. If the height of the mercury in theſe inſtruments be different from the mean, a correction is neceſſary to reduce the tabular to the true refraction. See REFRACTION.

TABLES V. VI. *Of the Dip of the Horizon.*

THE firſt of theſe tables contains the dip anſwering to a free or unobſtructed horizon; and the numbers therein, as well as in the other table, are to be ſubtracted from the obſerved altitude, when the fore-obſervation is uſed; but added, in the back-obſervation.

When the ſun is over the land, and the ſhip nearer it than the viſible horizon when unconfined: in this caſe, the ſun's limb is to be brought in contact with the line of ſeparation of the ſea and land: the diſtance of that place from the ſhip is to be found by eſtimation or otherwiſe; and the dip anſwering thereto, and the height of the eye, is to be taken from Table VI.

TABLE VII. *Of the Correction to be applied to the time of high water at full and change of the moon, to find the time of high water on any other day of the* [illegible]

THE uſe of this table is fully explained at Section II. Chap. I. Book I. of this article.

TABLES VIII. IX. X. *Of the Sun's declination*, &c.

THE firſt of theſe tables contains the ſun's declination, expreſſed in degrees, minutes, and tenths of a minute, for four ſucceſſive years, namely, 1793, 1794, 1795, and 1796: and by means of Table X. may eaſily be reduced to a future period; obſerving that, after the 28th of Febuary 1800, the declination anſwering to the day preceding that given is to be taken.

EXAMPLE I. Required the ſun's declination May 1. 1799?

May 1. 1799 is four years after the ſame day in 1795,

Explanation of the Tables.

Sun's declination May 1. 1795	-	15° 9′.1 N
Equation from Table X.	- -	+0 0 .6
Sun's declination May 1. 1799	-	15 9 .7 N

EXAMPLE II. Required the ſun's declination Auguſt 20. 1805?

The given year is 12 years after 1793, and the time is after the end of February 1800.

Now, Sun's dec. Auguſt 19. 1793	12°34′.6
Equation from Table X. to 12 years	—0 1 .2
Suns declination Auguſt 20. 1805	12 32 .7

The declination in Table VIII. is adapted to the meridian of Greenwich, and Table IX. is intended to reduce it to any other meridian, and to any given time of the day under that meridian. The titles at the top and bottom of this table direct when the reduction is to be added or ſubtracted.

TABLE XI. *Of the Right Aſcenſions and Declinations of Fixed Stars.*

This table contains the right aſcenſions and declinations of 60 principal fixed ſtars, adapted to the beginning of the year 1793. Columns fourth and ſixth contain the annual variation ariſing from the preceſſion of the equinoxes, and the proper motion of the ſtars; which ſerves to reduce the place of a ſtar to a period a few years after the epoch of the table with ſufficient accuracy. When the place of a ſtar is wanted, after the beginning of 1793, the variation in right aſcenſion is additive; and that in declination is to be applied according to its ſign. The contrary rule is to be uſed when the given time is before 1793.

EXAMPLE. Required the right aſcenſion and declination of Bellatrix, May 1. 1798?

Right aſcenſion January 1. 1793	=	5h 14 3″
Variation = 3″.21 × 5⅓ y.	=	+0 0 17
Right aſcenſion, May 1. 1798	=	5 14 20
Declination		6° 8′ 53″N
Variation = 4″ × 5⅓ y.	=	+0 0 21
Declination May 1. 1798	=	6 9 14 N

The various other tables neceſſary in the practice of navigation are to be found in moſt treatiſes on that ſubject. Thoſe uſed in this article are in Mackay's Treatiſes on the Longitude and Navigation.

TABLE I. *To reduce Points of the Compaſs to Degrees, and converſely.*

North-eaſt Quadrant.	South-eaſt. Quadrant.	Points.	D.	M.	S.	South-weſt. Quadrant.	North-weſt. Quadrant.
North.	South.	0 0	0	0	0	South.	North.
N¼E	S¼E	0 ¼	2	48	45	S¼W	N¼W
N½E	S½E	0 ½	5	37	30	S½W	N½W
N¾E	S¾E	0 ¾	8	26	15	S¾W	N¾W
N*b*E	S*b*E	1 0	11	15	0	S*b*W	N*b*W
N*b*E¼E	S*b*E¼E	1 ¼	14	3	45	S*b*W¼W	N*b*W¼W
N*b*E½E	S*b*E½E	1 ½	16	52	30	S*b*W½W	N*b*W½W
N*b*E¾E	S*b*E¾E	1 ¾	19	41	15	S*b*W¾W	N*b*W¾W
NNE	SSE	2 0	22	30	0	SSW	NNW
NNE¼E	SSE¼E	2 ¼	25	18	45	SSW¼W	NNW¼W
NNE½E	SSE½E	2 ½	28	7	30	SSW½W	NNW½W
NNE¾E	SSE¾E	2 ¾	30	56	15	SSW¾W	NNW¾W
NE*b*N	SE*b*S	3 0	33	45	0	SW*b*S	NW*b*N
NE¾N	SE¾S	3 ¼	36	33	45	SW¾S	NW¾N
NE½N	SE½S	3 ½	39	22	30	SW½S	NW½N
NE¼N	SE¼S	3 ¾	42	11	15	SW¼S	NW¼N
NE	SE	4 0	45	0	0	SW	NW
NE¼E	SE¼E	4 ¼	47	48	45	SW¼W	NW¼W
NE½E	SE½E	4 ½	50	37	30	SW½W	NW½W
NE¾E	SE¾E	4 ¾	53	26	15	SW¾W	NW¾W
NE*b*E	SE*b*E	5 0	56	15	0	SW*b*W	NW*b*W
NE*b*E¼E	SE*b*E¼E	5 ¼	59	3	45	SW*b*W¼W	NW*b*W¼W
NE*b*E½E	SE*b*E½E	5 ½	61	52	30	SW*b*W½W	NW*b*W½W
NE*b*E¾E	SE*b*E¾E	5 ¾	64	41	15	SW*b*W¾W	NW*b*W¾W
ENE	ESE	6 0	67	30	0	WSW	WNW
E*b*N¾N	E*b*S¾S	6 ¼	70	18	45	W*b*S¾S	W*b*N¾N
E*b*N½N	E*b*S½S	6 ½	73	7	30	W*b*S½S	W*b*N½N
E*b*N¼N	E*b*S¼S	6 ¾	75	56	15	W*b*S¼S	W*b*N¼N
E*b*N	E*b*S	7 0	78	45	0	W*b*S	W*b*N
E¾N	E¾S	7 ¼	81	33	45	W¾S	W¾N
E½N	E½S	7 ½	84	22	30	W½S	W½N
E¼N	E¼S	7 ¾	87	11	15	W¼S	W¼N
Eaſt.	Eaſt.	8 0	90	0	0	Weſt.	Weſt.

TAB. II. *The Miles and Parts of a Mile in a Degree of Longitude at every Degree of Latitude.*

D L.	Miles.	D.L.	Miles.	D.L.	Miles.	D.L.	Miles.	D.L.	Miles.	D.L.	Miles.
1	59.99	16	57.67	31	51.43	46	41.68	61	29.09	76	14.51
2	59.97	17	57.36	32	50.88	47	40.92	62	28.17	77	13 50
3	59.92	18	57.06	33	50.32	48	40.15	63	27.24	78	12.48
4	59.86	19	56.73	34	49.74	49	39.36	64	26.30	79	11.45
5	59.77	20	56.38	35	49.15	50	38.57	65	25.36	80	10.42
6	59.67	21	56 01	36	48.54	51	37.76	66	24.41	81	9.38
7	59.56	22	55.63	37	47.92	52	36.94	67	23.45	82	8.35
8	59 44	23	55.23	38	47.28	53	36.11	68	22.48	83	7.32
9	59.26	24	54.81	39	46.62	54	35.26	69	21.50	84	6.28
10	59.08	25	54.38	40	45 95	55	34.41	70	20.52	85	5.23
11	58.89	26	53.93	41	45.28	56	33.55	71	19.54	86	4.18
12	58.68	27	53.46	42	44.95	57	32.68	72	18.54	87	3.14
13	58.46	28	52.97	43	43.88	58	31.79	73	17.54	88	2.09
14	58.22	29	52.47	44	43.16	59	30.90	74	16.53	89	1.05
15	57.95	30	51.96	45	42.43	60	30.00	75	15.52	90	0.00

TAB. III. *The ſun's Semid*

Mon.	Day.	Sun's Semidiam.	
January.	1	16′	19″
	7	16	19
	13	16	19
	19	16	18
	25	16	17
February.	1	16	16
	7	16	15
	13	16	14
	19	16	13
	25	16	12
March.	1	16	10
	7	16	9
	13	16	7
	19	16	6
	25	16	4
April.	1	16	2
	7	16	1
	13	15	59
	19	15	57
	25	15	56
May.	1	15	54
	7	15	53
	13	15	52
	19	15	51
	25	15	50
June.	1	15	49
	7	15	48
	13	15	47
	19	15	47
	25	15	47
July.	1	15	47
	7	15	47
	13	15	47
	19	15	48
	25	15	48
Auguſt.	1	15	49
	7	15	50
	13	15	51
	19	15	52
	25	15	53
September.	1	15	55
	7	15	56
	13	15	58
	19	15	59
	25	16	1
October.	1	16	3
	7	16	4
	13	16	6
	19	16	8
	25	16	9
November.	1	16	11
	7	16	13
	13	16	14
	19	16	15
	25	16	16
December.	1	16	17
	7	16	18
	13	16	18
	19	16	19
	25	16	19

TABLE IV.
Refraction in Altitude.

App. Alt.	Refrac.	App. Alt.	Refrac.	App. Alt.	Refrac.
D. M.	M. S.	D. M.	M. S.	D.	M. S.
0 0	33 0	6 30	7 51	30	1 38
0 5	32 10	6 40	7 40	31	1 35
0 10	31 22	6 50	7 30	32	1 31
0 15	30 35	7 0	7 20	33	1 28
0 20	29 50	7 10	7 11	34	1 24
0 25	29 6	7 20	7 2	35	1 21
0 30	28 22	7 30	6 53	36	1 18
0 35	27 41	7 40	6 45	37	1 16
0 40	27 0	7 50	6 37	38	1 13
0 45	26 20	8 0	6 29	39	1 10
0 50	25 42	8 10	6 22	40	1 8
0 55	25 5	8 20	6 15	41	1 5
1 0	24 49	8 30	6 8	42	1 3
1 5	23 54	8 40	6 1	43	1 1
1 10	23 20	8 50	5 55	44	0 59
1 15	22 47	9 0	5 48	45	0 57
1 20	22 15	9 10	5 42	46	0 55
1 25	21 44	9 20	5 36	47	0 53
1 30	21 15	9 30	5 31	48	0 51
1 35	20 46	9 40	5 25	49	0 49
1 40	20 18	9 50	5 20	50	0 48
1 45	19 51	10 0	5 15	51	0 46
1 50	19 25	10 15	5 7	52	0 44
1 55	19 0	10 30	5 0	53	0 43
2 0	18 35	10 45	4 53	54	0 41
2 5	18 11	11 0	4 47	55	0 40
2 10	17 48	11 15	4 40	56	0 38
2 15	17 26	11 30	4 34	57	0 37
2 20	17 4	11 45	4 29	58	0 35
2 25	16 41	12 0	4 23	59	0 34
2 30	16 24	12 20	4 16	60	0 33
2 35	16 4	12 40	4 9	61	0 32
2 40	15 45	13 0	4 3	62	0 30
2 45	15 27	13 20	3 57	63	0 29
2 50	15 9	13 40	3 51	64	0 28
2 55	14 52	14 0	3 45	65	0 26
3 0	14 36	14 20	3 40	66	0 25
3 5	14 20	14 40	3 35	67	0 24
3 10	14 4	15 0	3 30	68	0 23
3 15	13 49	15 30	3 24	69	0 22
3 20	13 34	16 0	3 17	70	0 21
3 25	13 20	16 30	3 10	71	0 19
3 30	13 6	17 0	3 4	72	0 18
3 40	12 40	17 30	2 59	73	0 17
3 50	12 15	18 0	2 54	74	0 16
4 0	11 51	18 30	2 49	75	0 15
4 10	11 29	19 0	2 44	76	0 14
4 20	11 8	19 30	2 39	77	0 13
4 30	10 48	20 0	2 35	78	0 12
4 40	10 29	20 30	2 31	79	0 11
4 50	10 11	21 0	2 27	80	0 10
5 0	9 54	21 30	2 24	81	0 9
5 10	9 38	22 0	2 20	82	0 8
5 20	9 23	23 0	2 14	83	0 7
5 30	9 9	24 0	2 7	84	0 6
5 40	8 54	25 0	2 2	85	0 5
5 50	8 4	26 0	1 56	86	0 4
6 0	8 2	27 0	1 51	87	0 3
6 10	8 15	28 0	1 47	88	0 2
6 20	8 3	29 0	1 42	89	0 1

TABLE V.
Dip of the Horizon.

Height of eye.	Dip of Horizon.	Height of eye.	Dip of Horizon.	Height of eye.	Dip of Horizon.	Height of eye.	Dip of Horizon.
Feet.	M. S.	Feet.	M. S.	Feet.	M. S.	Feet.	M. S.
1	0 57	11	3 10	21	4 22	35	5 39
2	1 21	12	3 18	22	4 28	40	6 2
3	1 39	13	3 26	23	4 34	45	6 24
4	1 55	14	3 34	24	4 40	50	6 44
5	2 8	15	3 42	25	4 46	55	7 4
6	2 20	16	3 49	26	4 52	60	7 23
7	2 31	17	3 56	27	4 58	70	7 59
8	2 42	18	4 3	28	5 3	80	8 32
9	2 52	19	4 10	29	5 9	90	9 3
10	3 1	20	4 16	30	5 14	100	9 33

TABLE VI.
Dip of the Sea at different diſtances from the Obſerver.

Diſt. of land in ſea miles.	Height of the eye above the ſea in feet.							
	5	10	15	20	25	30	35	40
	Dip.	Dip.	Dip.	Dip.	Dip.	Dip.	Dip.	Dip.
	M.	M.	M.	M.	M.	M.	M.	M.
0 ¼	11	22	34	45	56	68	79	90
0 ½	6	11	17	22	28	34	39	45
0 ¾	4	8	12	15	19	23	27	30
1 0	4	6	9	12	15	17	20	23
1 ¼	3	5	7	9	12	14	16	19
1 ½	3	4	6	8	10	11	14	15
2 0	2	3	5	6	8	10	11	12
2 ½	2	3	5	6	7	8	9	10
3 0	2	3	4	5	6	7	8	8
3 ½	2	3	4	5	6	6	7	7
4 0	2	3	4	4	5	6	7	7
5 0	2	3	4	4	5	5	6	6
6 0	2	3	4	4	5	5	6	6

TABLE VII.
The correction to be applied to the Time of High-water at Full and Change of the Moon, to find the time of High-water on any other day.

Interval of Time.	After New or Full Moon.	Before 1ſt or 3d Quarter.	After 1ſt or 3d Quarter.	Before New or Full Moon.
	Additive.	Additive.	Additive.	Subtractive.
D. H.	H. M.	H. M.	H. M.	H. M.
0 0	0 0	5 6	5 6	0 0
0 6	0 8	4 51	5 22	0 9
0 12	0 17	4 37	5 40	0 18
0 18	0 26	4 23	6 0	0 27
1 0	0 36	4 9	6 20	0 37
1 6	0 45	3 56	6 39	0 47
1 12	0 54	3 44	6 58	0 57
1 18	1 2	3 32	7 18	1 7
2 0	1 11	3 21	7 37	1 17
2 6	1 19	3 11	7 56	1 28
2 12	1 28	3 1	8 14	1 39
2 18	1 37	2 50	8 31	1 51
3 0	1 46	2 40	8 47	2 4
3 6	1 54	2 30	9 2	2 16
3 12	2 3	2 21	9 17	2 29
3 18	2 12	2 12	9 31	2 44
4 0	2 21	2 3	9 44	2 58

TABLE VIII. *Sun's Declination for 1793, being the first after leap year.*

Days.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	22°57'1S.	16°52'3S.	7°17'0S.	4°49'9N	15°17'8N	22° 9'6N	23° 5'3N	17°52'6N	8° 3'0N	3°27'7S.	14°41'1S.	21°56'9S.
2	22 51.5	16 34.8	6 54.1	5 12.9	15 35.6	22 17.3	23 0.8	17 37.2	7 41.0	3 51.0	15 0.1	22 5.7
3	22 45.5	16 17.1	6 31.1	5 35.8	15 53.2	22 24.7	22 56.0	17 21.4	7 18.9	4 14.3	15 18.9	22 14.1
4	22 39.0	15 59.0	6 8.0	5 58.7	16 10.5	22 31.6	22 50.7	17 5.4	6 56.7	4 37.5	15 37.4	22 22.0
5	22 32.1	15 40.7	5 44.8	6 21.4	16 27.5	22 38.1	22 45.0	16 49.1	6 34.4	5 0.7	15 55.6	22 29.5
6	22 24.7	15 22.1	5 21.6	6 44.0	16 44.3	22 44.3	22 38.9	16 32.5	6 11.9	5 23.8	16 13.6	22 36.6
7	22 16.9	15 3.3	4 58.2	7 6.6	17 0.9	22 50.0	22 32.4	16 15.7	5 49.4	5 46.8	16 31.2	22 43.2
8	22 8.6	14 44.2	4 34.8	7 28.9	17 17.1	22 55.4	22 25.6	15 58.5	5 26.8	6 9.7	16 48.7	22 49.4
9	21 59.9	14 24.8	4 11.4	7 51.2	17 33.0	23 0.3	22 18.3	15 41.2	5 4.0	6 32.6	17 5.8	22 55.1
10	21 50.8	14 5.2	3 47.9	8 12.3	17 48.7	23 4.9	22 10.7	15 23.5	4 41.2	6 22.4	17 22.6	23 0.4
11	21 41.3	13 45.4	3 24.3	8 35.3	18 4.0	23 9.0	22 2.7	15 5.7	4 18.3	7 18.0	17 39.1	23 5.2
12	21 31.3	13 25.4	3 0.7	8 57.2	18 19.1	23 12.7	21 54.3	14 47.6	3 55.4	7 40.6	17 55.3	23 9.6
13	21 20.9	13 5.1	2 37.0	9 18.9	18 33.8	23 16.0	21 45.5	14 29.2	3 32.3	8 3.1	18 11.2	23 13.5
14	21 10.8	12 44.6	2 13.4	9 40.4	18 48.2	23 18.9	21 36.3	14 10.7	3 9.2	8 25.4	18 26.8	23 16.9
15	20 58.9	12 23.9	1 49.7	10 1.8	19 2.3	23 21.4	21 26.8	13 51.9	2 46.1	8 47.7	18 42.1	23 19.9
16	20 47.3	12 3.1	1 26.0	10 23.1	19 16.1	23 23.5	21 17.0	13 32.9	2 22.9	9 9.8	18 57.0	23 22.4
17	20 35.4	11 42.0	1 2.3	10 44.1	19 29.6	23 25.2	21 6.7	13 13.6	1 59.6	9 31.7	19 11.6	23 24.4
18	20 23.0	11 20.8	0 38.6	11 5.0	19 42.7	23 26.5	20 56.1	12 54.2	1 36.4	9 53.6	19 25.8	23 26.0
19	20 10.2	10 59.4	0 14.9S.	11 25.7	19 55.5	23 27.3	20 45.2	12 34.6	1 13.0	10 15.3	19 39.7	23 27.0
20	19 57.1	10 37.8	0 8.7N	11 46.2	20 8.0	23 27.7	20 33.9	12 14.7	0 49.7	10 36.8	19 53.2	23 27.7
21	19 43.6	10 16.3	0 32.4	12 6.5	20 20.1	23 27.8	20 22.3	11 54.7	0 26.3	10 58.2	20 6.4	23 27.8
22	19 29.7	9 54.1	0 56.0	12 26.6	20 31.9	23 27.3	20 10.3	11 34.5	0 2.9N	11 19.4	20 19.2	23 27.5
23	19 15.5	9 32.1	1 19.7	12 46.5	20 43.3	23 26.6	19 58.0	11 14.1	0 20.5S.	11 40.4	20 31.6	23 26.7
24	19 0.9	9 9.9	1 43.2	13 6.2	20 54.3	23 25.3	19 45.3	10 53.5	0 43.9	12 1.3	20 43.7	23 25.4
25	18 46.0	8 47.6	2 6.8	13 25.7	21 5.0	23 23.7	19 32.3	10 32.7	1 7.4	12 22.0	20 55.3	23 23.7
26	18 30.7	8 25.1	2 30.2	13 44.9	21 15.4	23 21.7	19 19.0	10 11.8	1 30.8	12 42.5	21 6.6	23 21.5
27	18 15.1	8 2.6	2 53.7	14 4.0	21 25.3	23 19.2	19 5.4	9 50.7	1 54.2	13 2.8	21 17.5	23 18.3
28	17 59.2	7 39.9	3 17.1	14 22.8	21 34.9	23 16.4	18 51.5	9 29.5	2 17.6	13 22.9	21 27.9	23 15.6
29	17 42.9		3 40.4	14 41.3	21 44.2	23 13.1	18 37.2	9 8.1	2 41.0	13 42.8	21 38.0	23 12.0
30	17 26.4		4 3.6	14 59.7	21 53.0	23 9.4	18 22.6	8 46.5	3 4.4	14 2.5	21 47.6	23 7.9
31	17 9.5		4 26.8		22 1.5		18 7.8	8 24.8		14 29.9		23 3.4

TABLE VIII. *Sun's Declination for 1794, being the second after leap year.*

Days.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	22°58'4S.	16°56'5S.	7°22'6S.	4°44'3N	15°13'0N	22° 7'7N	23° 6'4N	17°56'3N	8° 8'2N	3°22'2S.	14°36'5S.	21 54'7S.
2	22 52.9	16 39.1	6 59.7	5 7.4	15 31.3	22 15.5	23 2.0	17 40.9	7 46.3	3 45.5	14 55.6	22 3.6
3	22 47.0	16 21.4	6 36.7	5 30.4	15 49.0	22 23.0	22 57.2	17 25.2	7 24.2	4 8.7	15 14.3	22 12.1
4	22 40.6	16 3.4	6 13.6	5 53.2	16 6.4	22 30.0	22 52.0	17 9.2	7 2.1	4 31.9	15 32.9	22 20.1
5	22 33.8	15 45.1	5 50.4	6 16.0	16 23.5	22 36.6	22 46.4	16 53.0	6 39.8	4 55.1	15 51.2	22 27.7
6	22 26.5	15 26.6	5 27.2	6 38.6	16 40.3	22 42.8	22 40.4	16 36.5	6 17.4	5 18.1	16 9.2	22 34.9
7	22 18.8	15 7.8	5 3.8	7 1.2	16 56.9	22 48.7	22 34.0	16 19.7	5 54.9	5 41.2	16 26.9	22 46.6
8	22 10.7	14 48.8	4 40.5	7 23.6	17 13.2	22 54.1	22 27.3	16 2.7	5 32.3	6 4.1	16 44.4	22 47.9
9	22 2.1	14 29.5	4 17.0	7 45.8	17 29.2	22 59.2	22 20.1	15 45.4	5 9.6	6 27.0	17 1.6	22 53.7
10	21 53.1	14 10.0	3 53.5	8 8.0	17 44.9	23 3.8	22 12.6	15 27.9	4 46.8	6 49.7	17 18.4	22 59.1
11	21 43.6	13 50.2	3 30.0	8 30.0	18 0.3	23 8.0	22 4.7	15 10.1	4 24.0	7 12.4	17 35.0	23 4.1
12	21 33.8	13 30.3	3 6.4	8 51.9	18 15.4	23 11.9	21 56.4	14 52.1	4 1.0	7 35.0	17 51.3	23 8.5
13	21 23.5	13 10.1	2 42.8	9 13.6	18 30.2	23 15.3	21 47.7	14 33.8	3 38.0	7 57.5	18 7.3	23 12.5
14	21 12.8	12 49.7	2 19.2	9 35.2	18 44.7	23 18.3	21 38.6	14 15.3	3 15.0	8 19.9	18 23.0	23 16.1
15	21 1.7	12 29.1	1 55.5	9 56.6	18 58.9	23 20.9	21 29.2	13 56.5	2 51.8	8 42.2	18 38.3	23 19.2
16	20 50.2	12 8.2	1 31.8	10 17.8	19 12.8	23 23.1	21 19.4	13 37.6	2 28.6	9 4.3	18 53.3	23 21.8
17	20 38.4	11 47.2	1 8.2	10 38.9	19 26.3	23 24.8	21 9.3	13 18.4	2 5.4	9 26.3	19 8.0	23 23.9
18	20 26.1	11 26.1	0 44.5	10 59.8	19 39.5	23 26.2	20 58.8	12 59.0	1 42.1	9 48.2	19 22.3	23 25.6
19	20 13.4	11 4.7	0 20.8S.	10 20.6	19 52.4	23 27.2	20 47.9	12 39.4	1 18.8	10 9.9	19 36.3	23 26.8
20	20 0.4	10 43.1	0 2.9N	11 41.1	20 4.9	23 27.7	20 36.7	12 19.6	0 55.4	10 31.5	19 50.0	23 27.6
21	19 47.0	10 21.4	0 26.5	12 1.5	20 17.1	23 27.8	20 25.2	11 59.6	0 32.0	10 53.0	20 3.2	23 27.8
22	19 33.2	9 59.6	0 50.2	12 21.6	20 29.0	23 27.5	20 13.2	11 39.4	0 8.6N	11 14.2	20 16.1	23 27.6
23	19 19.0	9 37.5	1 13.8	12 41.6	20 40.5	23 26.8	20 1.0	11 19.0	0 14.8S.	11 35.3	20 28.6	23 26.9
24	19 4.5	9 15.4	1 37.4	13 1.4	20 51.6	23 25.7	19 48.4	10 58.5	0 38.3	11 56.3	20 40.8	23 25.1
25	18 49.7	8 53.1	2 1.0	13 20.9	21 2.4	23 24.2	19 35.5	10 37.8	1 1.7	12 17.0	20 52.6	23 24.2
26	18 34.5	8 30.6	2 24.5	13 40.2	21 12.9	23 22.2	19 22.3	10 16.8	1 25.2	12 37.6	21 3.9	23 22.1
27	18 18.9	8 8.1	2 47.9	13 59.3	21 23.0	23 19.9	19 8.7	9 55.8	1 48.6	12 57.9	21 14.9	23 19.5
28	18 3.1	7 45.4	3 11.4	14 18.2	21 32.7	23 17.1	18 54.8	9 34.6	2 12.0	13 18.1	21 25.5	23 16.5
29	17 46.9		3 34.7	14 36.9	21 42.0	23 13.9	18 40.7	9 13.2	2 35.4	13 38.0	21 35.6	23 13.0
30	17 30.4		3 8.0	14 55.2	21 50.9	23 10.4	18 26.2	8 51.7	2 58.8	13 57.8	21 45.4	23 9.0
31	17 13.6		4 21.2		1 59.5		18 11.4	8 30.0		14 17.3		23 4.6

TABLE VIII. *Sun's Declination for 1795, being the third after leap year.*

Days.	January.	February.	March.	April.	May	June.	July.	Auguſt.	September.	October.	November.	December.
1	22° 59'7S.	17° 0'7S.	7° 28'1S.	4° 38'8N	15° 9'1N	22° 5'8N	23° 7'4N	18° 0'0N	8° 13'5N	3° 16'4S.	14° 31'8S.	21° 52'4S.
2	22 54.3	16 43.4	7 5.3	5 1.8	15 27.1	22 13.7	23 3.1	17 44.7	7 51.7	3 39.7	14 50.9	21 1.4
3	22 48.5	16 25.8	6 42.3	5 24.8	15 44.8	22 21.2	22 58.5	17 29.1	7 29.6	4 3.0	15 9.7	22 10.0
4	22 42.3	16 7.9	6 19.3	5 47.7	16 2.2	22 28.3	22 53.3	17 13.2	7 7.5	4 26.2	15 28.3	22 18.2
5	22 35.5	15 49.7	5 56.1	6 10.4	16 19.4	22 35.0	22 47.8	16 57.0	6 45.2	4 49.4	15 46.7	22 25.9
6	22 28.4	15 31.3	5 32.9	6 33.1	16 36.3	22 41.4	22 42.0	16 40.6	6 22.9	5 12.5	16 4.8	22 33.2
7	22 20.8	15 12.5	5 9.6	6 55.6	16 52.9	22 47.3	22 35.7	16 23.9	6 0.4	5 35.5	16 22.6	22 40.0
8	22 12.8	14 53.6	4 46.3	7 18.1	17 9.3	22 52.9	22 29.0	16 6.9	5 37.8	5 58.5	16 40.1	22 46.4
9	22 4.3	14 34.4	4 22.8	7 40.4	17 25.3	22 58.0	22 21.9	15 49.7	5 15.1	6 21.4	16 57.4	22 52.4
10	21 55.4	14 14.9	3 59.4	8 2.6	17 41.1	23 2.7	22 14.5	15 32.2	4 52.4	6 44.2	17 14.4	22 57.9
11	21 46.0	13 55.2	3 35.8	8 24.6	17 56.6	23 7.1	22 6.7	15 14.4	4 29.5	7 6.9	17 31.0	23 2.9
12	21 36.3	13 35.3	3 12.3	8 46.5	18 11.8	23 11.0	21 58.4	14 56.4	4 6.6	7 29.6	17 47.4	23 7.5
13	21 26.1	13 15.1	2 48.6	9 8.3	18 26.7	23 14.5	21 49.8	14 38.2	3 43.6	7 52.1	18 3.5	23 11.7
14	21 15.5	12 54.8	2 25.0	9 29.9	18 41.3	23 17.6	21 40.9	14 19.7	3 20.5	8 14.5	18 19.2	23 15.3
15	21 4.5	12 34.2	2 1.3	9 51.4	18 55.6	23 20.3	21 31.5	14 1.0	2 57.4	8 36.8	18 34.7	23 18.5
16	20 53.1	12 13.4	1 37.7	10 12.7	19 9.5	23 22.6	21 21.9	13 42.1	2 34.2	8 59.0	18 49.8	23 21.2
17	20 41.3	11 52.4	1 13.9	10 33.9	19 24.1	23 24.5	21 11.8	13 23.0	2 10.9	9 21.1	19 4.5	23 23.5
18	20 29.2	11 31.3	0 50.2	10 54.8	19 36.4	23 25.9	21 1.3	13 3.6	1 47.6	9 43.0	19 18.9	23 25.3
19	20 16.6	11 9.9	0 26.5	11 15.6	19 49.4	23 27.0	20 50.6	12 44.1	1 24.3	10 4.8	19 33.0	23 26.6
20	20 3.6	10 48.4	0 2.8S.	11 36.2	20 2.0	23 27.6	20 39.4	12 24.3	1 0.9	10 26.4	19 46.7	23 27.5
21	19 50.3	10 26.7	0 20.8N	11 56.7	20 14.3	23 27.9	20 27.9	12 4.4	0 37.6	10 47.8	20 0.1	23 27.9
22	19 36.6	10 4.9	0 44.5	12 16.9	20 26.2	23 27.7	20 16.1	11 44.2	0 14.2N	11 9.1	20 13.1	23 27.8
23	19 22.5	9 42.9	1 8.1	12 36.9	20 37.8	23 27.0	20 4.0	11 23.9	0 9.2S.	11 30.3	20 25.7	23 27.2
24	19 8.1	9 20.7	1 31.8	12 56.7	20 49.1	23 26.0	19 51.5	11 3.4	0 32.7	11 51.2	20 37.9	23 26.2
25	18 53.3	8 58.5	1 55.3	13 16.3	21 0.0	23 24.6	19 38.6	10 42.7	0 56.1	12 12.0	20 49.7	23 24.6
26	18 38.2	8 36.1	2 18.9	13 35.7	21 10.5	23 22.7	19 25.5	10 21.9	1 19.5	12 32.6	21 1.2	23 22.7
27	18 22.8	8 13.5	2 42.3	13 54.8	21 20.6	23 20.5	19 12.0	10 0.9	1 42.9	12 53.0	21 12.2	23 20.2
28	18 7.0	7 50.9	3 5.8	14 13.8	21 30.4	23 17.8	18 58.2	9 39.7	2 6.3	13 13.2	21 22.9	23 17.3
29	17 50.9		3 29.1	14 32.5	21 39.8	23 14.3	18 44.1	9 18.4	2 29.7	13 33.2	21 33.1	23 13.9
30	17 34.5		3 52.4	14 50.9	21 48.9	23 11.3	18 29.7	8 56.9	2 53.1	13 52.9	21 43.0	23 10.1
31	17 17.7		4 15.6		21 57.5		18 15.0	8 35.3		14 12.0		

TABLE VIII. *Sun's Declination 1796 being leap year.*

Days.	January.	February.	March	April.	May.	June	July.	August	September.	October	November.	December.
1	23° 1'0S.	17° 5'0S.	7° 11'0S.	4° 56'1N	15° 22'7N	22° 11'8N	23° 4'2N	17° 48'5N	7° 57'0N	3° 34'1S.	14° 46'4S.	21° 59'4S.
2	22 55.7	16 47.8	6 48.0	5 19.1	15 40.5	22 19.5	22 59.6	17 32.9	7 35.0	3 57.4	15 5.3	22 8.1
3	22 50.0	16 30.2	6 25.0	5 42.1	15 58.0	22 26.7	22 54.6	17 17.1	7 12.9	4 20.6	15 24.0	22 16.3
4	22 43.9	16 12.4	6 1.9	6 4.9	16 15.2	22 33.5	22 49.2	17 1.0	6 50.6	4 43.8	15 42.4	22 24.2
5	22 37.3	15 54.2	5 38.6	6 27.6	16 32.2	22 39.9	22 43.4	16 44.6	6 28.3	5 7.0	16 0.5	22 31.6
6	22 30.2	15 35.8	5 15.4	6 50.2	16 49.0	22 46.0	22 37.3	16 27.9	6 5.8	5 30.0	16 18.4	22 38.5
7	22 22.7	15 17.2	4 52.0	7 12.7	17 5.4	22 51.6	22 30.7	16 11.0	5 43.2	5 53.0	16 36.0	22 45.0
8	22 14.8	14 58.3	4 28.6	7 35.0	17 21.6	22 56.9	22 23.7	15 53.8	5 20.6	6 16.0	16 53.3	22 51.1
9	22 6.4	14 39.1	4 5.1	7 57.3	17 37.4	23 1.7	22 16.3	15 36.4	4 57.8	6 38.8	17 10.4	22 56.7
10	21 57.6	14 19.7	3 41.5	8 19.4	17 53.0	23 6.1	22 8.6	15 18.7	4 35.0	7 1.5	17 27.1	23 1.8
11	21 48.4	14 0.0	3 18.0	8 41.3	18 8.2	23 10.1	22 0.5	15 0.8	4 12.1	7 24.2	17 43.6	23 6.5
12	21 38.7	13 40.1	2 54.3	9 3.1	18 23.2	23 13.8	21 52.0	14 42.6	3 49.1	7 46.7	17 59.7	23 10.7
13	21 28.7	13 20.0	2 30.7	9 24.8	18 37.9	23 17.0	21 43.1	14 24.2	3 26.1	8 9.1	18 15.5	23 14.5
14	21 18.2	12 59.7	2 7.0	9 46.3	18 52.2	23 19.8	21 33.9	14 5.6	3 3.0	8 31.5	18 31.0	23 17.8
15	21 7.3	12 39.2	1 43.4	10 7.7	19 6.2	23 22.1	21 24.2	13 46.8	2 39.8	8 53.6	18 46.2	23 20.7
16	20 56.0	12 18.5	1 19.7	10 28.8	19 19.9	23 24.1	21 14.3	13 27.7	2 16.6	9 15.7	19 1.0	23 23.0
17	20 44.3	11 57.5	0 56.0	10 49.8	19 33.3	23 25.7	21 3.9	13 8.4	1 53.3	9 37.6	19 15.5	23 24.9
18	20 32.2	11 36.4	0 32.3	11 10.7	19 46.3	23 26.8	20 53.3	12 48.9	1 30.1	9 59.4	19 29.6	23 26.4
19	20 19.7	11 15.2	0 8.6S.	11 31.3	19 59.0	23 27.5	20 42.2	12 29.2	1 6.7	10 21.1	19 43.4	23 27.3
20	20 6.9	10 53.7	0 15.1N	11 51.7	20 11.4	23 27.9	20 30.8	12 9.3	0 43.3	10 42.6	19 56.9	23 27.8
21	19 53.6	10 32.1	0 38.7	12 12.0	20 23.4	23 27.8	20 19.1	11 49.3	0 20.0N	11 3.9	20 9.9	23 27.9
22	19 40.0	10 10.3	1 2.4	12 32.0	20 35.1	23 27.3	20 7.0	11 29.0	0 3.4S	11 25.1	20 22.6	23 27.4
23	19 26.1	9 48.4	1 26.0	12 51.9	20 46.4	23 26.3	19 54.6	11 8.5	0 26.9	11 46.1	20 35.0	23 26.5
24	19 11.7	9 26.3	1 49.5	13 11.5	20 57.4	23 25.0	19 41.9	10 47.9	0 50.3	12 7.0	20 46.9	23 25.1
25	18 57.1	9 4.0	2 13.1	13 30.9	21 8.0	23 23.3	19 28.8	10 27.1	1 13.7	12 27.6	20 58.5	23 23.2
26	18 42.0	8 41.7	2 36.6	13 50.2	21 18.2	23 21.1	19 15.4	10 6.1	1 37.2	12 48.0	21 9.6	23 20.9
27	18 26.7	8 19.2	3 0.0	14 9.1	21 28.5	23 18.6	19 1.7	9 45.0	2 0.6	13 8.3	21 20.4	23 18.1
28	18 11.0	7 56.6	3 23.3	14 27.9	21 37.6	23 15.6	18 47.6	9 23.7	2 24.0	13 28.4	21 30.8	23 14.8
29	17 55.0	7 33.8	3 46.6	14 46.4	21 46.7	23 12.2	18 33.3	9 2.3	2 47.4	13 48.2	21 40.7	23 11.1
30	17 38.6		4 9.9	15 4.7	21 55.5	23 8.4	18 18.6	8 40.6	3 10.8	14 7.8	21 50.3	23 6.8
31	17 22.0		4 33.0		22 3.8		18 3.7	8 18.9		14 27.2		23 2.2

TABLE IX. To reduce the Sun's Declination to any other Meridian, and to any given Time under that Meridian.

	Add in W. Sub. in E.		Sub. in W. Add in E.	LONGITUDE.																		Add in W. Sub. in E.		Sub. in W. Add in E.	
				10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°	140°	150°	160°	170°	180°				
December.	21	December.	21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21	June.	21	June.
	20		22	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	20		22	
	19		23	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	19		23	
	18		24	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	18		24	
	17		25	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	17		25	
	16		26	0.1	0.1	0.2	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.8	0.9	1.0	1.0	1.1	16		26	
	15		27	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.8	0.9	0.9	1.0	1.1	1.2	1.2	1.3	15		27	
	14		28	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.9	1.0	1.1	1.2	1.3	1.4	1.4	1.5	14		28	
	13		29	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	13		29	
	12		30	0.1	0.2	0.3	0.4	0.5	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.9	2.0	12		30	
December.	11	January.	31	0.1	0.2	0.4	0.5	0.6	0.7	0.8	1.0	1.1	1.2	1.3	1.5	1.6	1.7	1.8	1.9	2.1	2.2	11	June.	1	July.
	10		1	0.1	0.3	0.4	0.5	0.7	0.8	0.9	1.1	1.2	1.3	1.5	1.6	1.7	1.9	2.0	2.1	2.3	2.4	10		2	
	9		2	0.1	0.3	0.4	0.6	0.7	0.9	1.0	1.2	1.3	1.5	1.6	1.8	1.9	2.0	2.2	2.3	2.5	2.6	9		3	
	8		3	0.1	0.3	0.5	0.6	0.8	0.9	1.1	1.3	1.4	1.6	1.7	1.9	2.1	2.2	2.4	2.5	2.7	2.8	8		4	
	7		4	0.2	0.3	0.5	0.7	0.8	1.0	1.2	1.4	1.5	1.7	1.9	2.0	2.2	2.4	2.6	2.7	2.9	3.1	7		5	
	6		5	0.2	0.4	0.5	0.7	0.9	1.1	1.3	1.4	1.6	1.8	2.0	2.2	2.4	2.5	2.7	2.9	3.1	3.3	6		6	
	5		6	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	5		7	
	4		7	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	4		8	
	3		8	0.2	0.4	0.6	0.9	1.1	1.3	1.5	1.7	1.9	2.2	2.4	2.6	2.8	3.0	3.2	3.5	3.7	3.9	3		9	
	2		9	0.2	0.4	0.7	0.9	1.1	1.4	1.6	1.8	2.0	2.3	2.5	2.7	3.0	3.2	3.4	3.6	3.9	4.1	2		10	
November.	1	January.	10	0.2	0.5	0.7	0.9	1.2	1.4	1.7	1.9	2.1	2.4	2.6	2.9	3.1	3.3	3.6	3.8	4.1	4.3	1	May.	11	July.
	30		11	0.2	0.5	0.7	1.0	1.2	1.5	1.7	2.0	2.2	2.5	2.7	3.0	3.2	3.5	3.7	4.0	4.2	4.5	31		12	
	29		12	0.3	0.5	0.8	1.0	1.3	1.6	1.8	2.1	2.3	2.6	2.9	3.1	3.4	3.6	3.9	4.2	4.4	4.7	30		13	
	28		13	0.3	0.5	0.8	1.1	1.4	1.6	1.9	2.2	2.4	2.7	3.0	3.3	3.5	3.8	4.1	4.3	4.6	4.9	29		14	
	27		14	0.3	0.6	0.8	1.1	1.4	1.7	2.0	2.3	2.5	2.8	3.1	3.4	3.7	4.0	4.2	4.5	4.8	5.1	28		15	
	26		15	0.3	0.6	0.9	1.2	1.5	1.8	2.0	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.4	4.7	5.0	5.3	27		16	
	25		16	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.6	4.9	5.2	5.5	26		17	
	24		17	0.3	0.6	0.9	1.3	1.6	1.9	2.2	2.5	2.8	3.1	3.5	3.8	4.1	4.4	4.7	5.0	5.3	5.7	25		18	
	23		18	0.3	0.6	1.0	1.3	1.6	1.9	2.3	2.6	2.9	3.2	3.6	3.9	4.2	4.5	4.9	5.2	5.5	5.8	24		19	
	22		19	0.3	0.7	1.0	1.3	1.7	2.0	2.3	2.7	3.0	3.3	3.7	4.0	4.3	4.7	5.0	5.4	5.7	6.0	23		20	
November.	21	January.	20	0.3	0.7	1.0	1.4	1.7	2.1	2.4	2.8	3.1	3.4	3.8	4.1	4.5	4.8	5.2	5.5	5.9	6.2	22	May.	21	July.
	20		21	0.4	0.7	1.1	1.4	1.8	2.1	2.5	2.8	3.2	3.5	3.9	4.3	4.6	5.0	5.3	5.7	6.0	6.4	21		22	
	19		22	0.4	0.7	1.1	1.5	1.8	2.2	2.5	2.9	3.3	3.6	4.0	4.4	4.7	5.1	5.5	5.8	6.2	6.6	20		23	
	18		23	0.4	0.7	1.1	1.5	1.9	2.2	2.6	3.0	3.4	3.7	4.1	4.5	4.9	5.2	5.6	6.0	6.4	6.7	19		24	
	17		24	0.4	0.8	1.1	1.5	1.9	2.3	2.7	3.1	3.4	3.8	4.2	4.6	5.0	5.4	5.7	6.1	6.5	6.9	18		25	
	16		25	0.4	0.8	1.2	1.6	2.0	2.3	2.7	3.1	3.5	3.9	4.3	4.7	5.1	5.5	5.9	6.3	6.7	7.1	17		26	
	15		26	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4	6.8	7.2	16		27	
	14		27	0.4	0.8	1.2	1.6	2.1	2.5	2.9	3.3	3.7	4.1	4.5	4.9	5.3	5.8	6.2	6.6	7.0	7.4	15		28	
	13		28	0.4	0.8	1.3	1.7	2.1	2.5	2.9	3.4	3.8	4.2	4.6	5.0	5.5	5.9	6.3	6.7	7.1	7.6	14		29	
	11		30	0.4	0.9	1.3	1.7	2.2	2.6	3.1	3.5	3.9	4.4	4.8	5.2	5.7	6.1	6.6	7.0	7.4	7.9	12		31	
November.	9	February.	1	0.4	0.9	1.4	1.8	2.3	2.7	3.2	3.6	4.1	4.5	5.0	5.4	5.9	6.4	6.8	7.3	7.7	8.2	10	May.	2	August.
	7		3	0.5	0.9	1.4	1.9	2.3	2.8	3.3	3.8	4.2	4.7	5.2	5.6	6.1	6.6	7.0	7.5	8.0	8.5	8		4	
	5		5	0.5	1.0	1.4	1.9	2.4	2.9	3.4	3.9	4.3	4.8	5.3	5.8	6.3	6.8	7.3	7.7	8.2	8.7	6		6	
	3		7	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	4		8	
	1		9	0.5	1.0	1.5	2.0	2.5	3.1	3.6	4.1	4.6	5.1	5.6	6.1	6.7	7.2	7.7	8.2	8.7	9.2	2		10	
October.	30		11	0.5	1.0	1.6	2.1	2.6	3.1	3.7	4.2	4.7	5.3	5.8	6.3	6.8	7.3	7.9	8.4	8.9	9.5	30	April.	12	
	28		13	0.5	1.1	1.6	2.1	2.7	3.2	3.8	4.3	4.8	5.4	5.9	6.5	7.0	7.5	8.1	8.6	9.1	9.7	28		14	
	26		15	0.5	1.1	1.6	2.2	2.7	3.3	3.8	4.4	4.9	5.5	6.0	6.6	7.2	7.7	8.2	8.8	9.3	9.9	26		16	
	24		17	0.6	1.1	1.7	2.2	2.8	3.4	3.9	4.5	5.0	5.6	6.2	6.7	7.3	7.9	8.4	9.0	9.6	10.1	24		18	
	21		20	0.6	1.1	1.7	2.3	2.9	3.5	4.0	4.6	5.2	5.8	6.3	6.9	7.5	8.1	8.7	9.2	9.8	10.4	21		21	
October.	18		23	0.6	1.2	1.8	2.4	3.0	3.5	4.1	4.7	5.3	5.9	6.5	7.1	7.7	8.3	8.9	9.5	10.0	10.6	18	April.	24	August.
	15		26	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	7.2	7.9	8.5	9.1	9.7	10.3	10.9	15		27	
	12	March.	1	0.6	1.2	1.8	2.5	3.1	3.7	4.3	4.9	5.5	6.2	6.8	7.4	8.0	8.6	9.2	9.8	10.5	11.1	12		30	
	9		4	0.6	1.2	1.9	2.5	3.1	3.7	4.4	5.0	5.6	6.3	6.9	7.5	8.1	8.8	9.4	10.0	10.6	11.3	9		2	September.
	6		7	0.6	1.3	1.9	2.5	3.2	3.8	4.4	5.1	5.7	6.3	7.0	7.6	8.2	8.9	9.5	10.1	10.8	11.4	6		5	
	3		10	0.6	1.3	1.9	2.6	3.2	3.8	4.5	5.1	5.8	6.4	7.0	7.7	8.3	9.0	9.6	10.3	10.9	11.5	3		8	
Septem.	30		13	0.6	1.3	1.9	2.6	3.2	3.9	4.5	5.2	5.8	6.5	7.1	7.7	8.4	9.0	9.7	10.3	11.0	11.6	31	March.	11	
	27		16	0.7	1.3	1.9	2.6	3.2	3.9	4.5	5.2	5.8	6.5	7.1	7.8	8.4	9.1	9.7	10.4	11.0	11.7	28		14	
	24		19	0.7	1.3	2.0	2.6	3.2	3.9	4.5	5.2	5.9	6.5	7.2	7.8	8.5	9.1	9.8	10.4	11.1	11.7	25		17	
	21		22	0.7	1.3	2.0	2.6	3.3	3.9	4.6	5.2	5.9	6.5	7.2	7.8	8.5	9.1	9.8	10.4	11.1	11.7	22		20	
	Add aft. N. Sub. bef. N.		Sub. aft. N. Add bef. N.	0h⅔	1h⅓	2h0	2h⅔	3h⅓	4h0	4h⅔	5h⅓	6h0	6h⅔	7h⅓	8h0	8h⅔	9h⅓	10h0	10h⅔	11h⅓	12h0	Add aft. N. Sub. bef. N.		Sub. aft. N. Add bef. N.	
				Time from Noon.																					

TABLE X. *Change of Sun's declin.*

Mont.	Days.	Complete Years. 4	8	12	16
January.	1	0′—1	0′—3	0′—4	0′—6
	7	0 .2	0 .4	0 .7	0 .9
	13	0 .3	0 .6	0 .9	1 .2
	19	0 .4	0 .7	1 .1	1 .4
	25	0 .4	0 .8	1 .3	1 .7
February.	1	0 .5	1 .0	1 .5	2 .0
	7	0 .5	1 .1	1 .6	2 .2
	13	0 .6	1 .2	1 .7	2 .3
	19	0 .6	1 .2	1 .9	2 .5
	25	0 .7	1 .3	2 .0	2 .6
March.	1	0 .7	1 .3	2 .0	2 .7
	7	0 .7	1 .4	2 .1	2 .7
	13	0 .7	1 .4	2 .1	2 .8
	19	0 .7	1 .4	2 .1	2 .8
	25	0+.7	1+4	2+1	2+.8
April.	1	0 .7	1 .4	2 .1	2 .8
	7	0 .7	1 .4	2 .1	2 7
	13	0 .7	1 .3	2 .0	2 .6
	19	0 .6	1 .3	1 .9	2 .5
	25	0 .6	1 .2	1 .8	2 .4
May.	1	0 .6	1 .1	1 .7	2 .3
	7	0 .5	1 .0	1 .6	2 .1
	13	0 .5	0 .9	1 .4	1 .9
	19	0 .4	0 .8	1 .2	1 .6
	25	0 .3	0 .7	1 .0	1 .3
June.	1	0 .3	0 .5	0 .8	1 .0
	7	0 .2	0 .4	0 .5	0 .7
	13	0 .1	0 .2	0 .3	0 .4
	19	0 .0	0 .0	0 .1	0 .1
	25	0—.1	0— 1	0— 2	0— 3
July.	1	0 .1	0 .3	0 .4	0 .6
	7	0 .2	0 .4	0 .7	0 .9
	13	0 .3	0 .6	0 .9	1 .2
	19	0 .4	0 .7	1 .1	1 .4
	25	0 .4	0 .9	1 .3	1 .7
Auguſt.	1	0 .5	1 .0	1 .5	2 .0
	7	0 .5	1 .1	1 .6	2 .2
	13	0 .6	1 .2	1 .8	2 .4
	19	0 .6	1 .3	1 .9	2 .5
	25	0 .7	1 .3	2 .0	2 .6
September.	1	0 .7	1 .4	2 .0	2 .7
	7	0 .7	1 .4	2 .1	2 .8
	13	0 .7	1 .4	2 .1	2 .8
	19	0 .7	1 .4	2 .1	2 .9
	25	0+7	1+4	2+1	2+8
October.	1	0 .7	1 .4	2 .1	2 .8
	7	0 .7	1 .4	2 .0	2 .7
	13	0 .7	1 .3	2 .0	2 .6
	19	0 .6	1 .3	1 .9	2 .5
	25	0 .6	1 .2	1 .8	2 .4
November.	1	0 .5	1 .1	1 .6	2 .2
	7	0 .5	1 .0	1 .5	2 .0
	13	0 .4	0 .9	1 .3	1 .8
	19	0 .4	0 .8	1 .2	1 .5
	25	0 .3	0 .7	1 .0	1 .3
December.	1	0 .2	0 .5	0 .7	1 .0
	7	0 .2	0 .4	0 .5	0 .7
	13	0 .1	0 .2	0 .3	0 .4
	19	0 .0	0 .0	0 .1	0 .1
	25	0— 1	0— 1	0— 1	0— 2

TABLE XI *The Right Aſcenſions and Declinations of the principal fixed Stars, adapted to the beginning of the Year 1793.*

Name of Stars.	Mag.	Right Aſcen. in Time.	Ann. Var.	Declination.	Ann. Var.
γ Pegaſi	2	0h 2′ 35″	3′ .06	14° 1′ 55″ N	+20″ .0
β Ceti	2	0 33 11	3 .01	19 7 32 S	—19 .8
Alrucabah, pole ſtar	2.3	0 50 44	12 .42	88 12 8 N	+19 .6
Mirach	2	0 58 10	3 .31	34 31 13 N	+19 .4
Achernar	1	1 30 0	2 .25	58 17 33 S	—18 .5
Almaach	2	1 51 15	3 .62	41 19 47 N	+17 .7
Menkar	2	2 51 28	3 .11	3 16 17 N	+14 .7
Algol	Var.	2 54 45	3 .85	40 8 47 N	+14 .5
Algenib	2	3 9 38	4 .21	49 6 40 N	+13 .6
Aldebaran	1	4 24 3	3 .42	16 4 48 N	+ 8 .2
Capella	1	5 1 25	4 41	45 46 15 N	+ 5 .1
Rigel	1	5 4 31	2 .87	8 27 9 S	— 4 .8
β Tauri	2	5 13 13	3 .78	28 25 1 N	+ 4 .1
Bellatrix	2	5 14 3	3 .21	6 8 53 N	+ 4 .0
δ Orionis	2	5 21 27	3 .07	0 27 50 S	— 3 .4
ε Orionis	2	5 25 44	3 .04	1 20 45 S	— 3 .0
ζ Orionis	2	5 30 20	3 .03	2 3 52 S	— 2 .6
α Columbæ	2	5 32 10	2 .17	34 11 34 S	— 2 .4
Betelgueſe	1	5 43 58	3 .24	7 21 17 N	+ 1 .4
β Canis Majoris	2.3	6 13 37	2 .65	17 51 56 S	+ 1 .2
Canopus	1	6 19 22	1 .33	52 35 16 S	+ 1 .7
Sirius	1	6 36 1	2 .65	16 26 35 S	+ 4 .3
δ Canis Majoris	2	6 59 59	2 .44	26 4 32 S	+ 5 .2
Caſtor	1.2	7 21 22	3 85	32 19 30 N	— 6 .9
Procyon	1.2	7 28 27	3 .14	5 45 3 N	— 7 .5
Pollux	2.3	7 32 37	3 .69	28 30 42 N	— 7 .9
ζ Navis	2	7 56 19	2 .11	39 25 36 S	+ 9 .7
γ Navis	2	8 3 10	1 .85	46 43 54 S	+10 .3
Acubens	3	8 47 8	3 .30	12 39 6 N	—13 .4
β Navis	1	9 10 54	0 .75	68 52 2 S	+14 .8
Alphard	2	9 17 24	2 .93	7 46 7 S	+15 .2
Regulus	1	9 57 20	3 .20	12 58 21 N	—17 .2
η Navis	2	10 37 4	2 .30	58 36 3 S	+18 .7
β Urſæ Majoris	2	10 49 14	3 .71	57 29 17 N	—19 .1
Dubhe	2	10 50 49	3 .85	62 52 9 N	—19 .1
β Leonis	2	11 38 29	3 . 6	15 43 47 N	—19 .9
γ Urſæ Majoris	2	11 46 51	3 .22	54 50 47 N	—20 .0
α Crucis	1	12 15 14	3 .24	61 57 6 S	+20 .0
γ Crucis	2	12 19 47	3 .24	55 57 2 S	+20 .0
β Crucis	2	12 35 46	3 .41	58 33 19 S	+19 .8
Alhath	2	12 44 51	2 .67	57 5 14 N	—19 .7
Spica Virginis	1	13 14 18	3 .13	10 4 31 S	+19 .0
ζ Urſæ Majoris	2	13 15 32	2 .43	56 0 41 N	—19 .0
Benetnach	2	13 39 23	2 .40	50 21 7 N	—18 .2
β Centauri	1.2	13 49 23	4 .11	59 21 49 S	+17 .8
Arcturus	1	14 6 13	2 .72	20 15 58 N	—19 .1
α Centauri	1	14 26 1	4 .45	59 58 44 S	+16 .1
Alphacca	2	15 25 55	2 .53	27 25 16 N	—12 .5
β Scorpii	2	15 53 26	3 .47	10 13 29 S	+10 .5
Antares	1	16 16 44	3 .64	25 57 22 S	+ 8 .7
Ras. Algethi	2	17 5 13	2 .73	14 38 18 N	— 4 .8
Ras. Alhague	2	17 25 20	2 .77	12 43 28 N	— 3 .0
Vega	1	18 29 56	2 .02	38 35 51 N	+ 2 .6
Altair	1.2	19 40 41	2 .92	8 19 48 N	+ 8 .5
Deneb	2	20 34 22	2 .03	44 32 51 N	+12 .5
α Gruis	2	21 55 6	3 .85	47 57 8 S	—17 .1
Fomalhaut	1	22 46 10	3 .33	30 42 51 S	—19 .0
Scheat	2	22 53 45	2 .87	26 57 41 N	+19 .2
Markab	2	22 54 27	2 .96	14 5 42 N	+19 .2
α Andromache	2	23 57 43	3 .07	27 56 51 N	+20 .0

Navigation of the antients. See Phœnicia and Trade.

Inland Navigation, the method of conveying commodities from one part of a country to another by means of rivers, lakes, canals, or arms of the ſea, penetrating far into the internal parts. See the article Canal.

The advantages of this mode of conveyance, in an extenſive and populous country, are ſufficiently obvious; whether we take into account the ſuperior cheapneſs, facility, or quickneſs with which great quantities of goods can thus be carried from one place to another; or the advantages which may accrue to agriculture and other arts, by thus conveying manures, the produce of the ground, or heavy manufactured goods, to and from diſtant quarters; which would be altogether, impracticable by a land-carriage, without incurring a much greater expence than commodities could bear. The good effects of inland navigation are particularly evident in the vaſt empire of China, and in the ſtates of Holland. In both theſe countries, the multitude of canals undoubtedly contributes to the opulence of the inhabitants, both by the more free ſcope they give to trade, and the advantages derived from them to agriculture; not to mention, that by means of the canals themſelves the ground is often meliorated and made capable of producing both corn and paſture, where otherwiſe it would perhaps yield neither, or at leaſt very imperfectly. Theſe countries, however, particularly Holland, are very flat, and thus very much fitted for this kind of navigation: Great Britain and Ireland are leſs ſo, on account of the greater inequality of their ſurface; though in them alſo the making of canals is now become very common, notwithſtanding the immenſe expence with which ſuch undertakings are attended.

In a late treatiſe upon this ſubject by Mr Edmund Leach ſurveyor, the author conſiders the advantages which might accrue to the kingdoms of Britain and Ireland, were their Inland navigation improved as much as it might be; and he conſiders both countries as exceedingly proper for improvements of this kind on account of the number of fine ſtreams of water they contain. "Every county (ſays he) in each kingdom is furniſhed with rivers and ſtreams of water; very few, if any, of which but may be made navigable to within a mile or two of their ſources," by the method he propoſes.

The method of making canals hitherto practiſed, is ſo fully deſcribed under the article Canal, that nothing needs be ſaid upon it in this place. Mr Leach obſerves, that all the artificial inland navigations made in this, as well as in other kingdoms, have been done by beginning them at the foot or mouth of a river, or at the utmoſt extent of the ebb or flow of the tide; proceeding thence upwards, either in the ordinary courſe of the river by ſinking, widening, and cleanſing it; then with the aſſiſtance of a lock and dam to raiſe the boats or other veſſels to a higher level. This is next to be cut, widened, and cleanſed as before, till we come to a third level, when the veſſels are to be raiſed as in the former; proceeding thus, as it were ſtep by ſtep, till we arrive at the extent of the intended navigation. Otherwiſe the navigation is carried by an artificial ſide-cut or canal near the courſe of the river, raiſed up by locks and dams as before. Theſe methods, however, tho' probably of very great ſervice to the country, are attended with many and conſiderable inconveniences.

1. Every river or other ſtream is the natural receptacle of all the ſprings, rains, and floods, which diſcharge themſelves into it; by which means it ſometimes diſcharges ſuch torrents of water as ſweep every thing away before them. This not only interrupts the navigation for a time, but is often attended with the moſt intolerable expence.

2. The original making of the canal with a number of locks and dams, ſuch as is deſcribed under the article Canal, muſt alſo be very expenſive.

3. Some rivers run very rapidly in particular places; and if the deſcent of the bed be very great, it will require a number of the locks and dams already mentioned to make ſuch a river navigable, though the navigation ſhould extend but a few miles from the mouth.

4. The paſſing of the locks is always attended with a conſiderable difficulty, beſides the loſs of time and expence.

To obviate all theſe inconveniences, Mr Leach propoſes to begin and carry on his canal in a manner preciſely the reverſe of that juſt now deſcribed. In his method, the canal is to be begun as near the ſource of the river as poſſible; that is, as near as there is a probability of having water in the drieſt ſeaſons ſufficient to fill the canal; of which there can be but little required, as a ſtream ſufficient to turn an ordinary mill muſt be ſufficient to anſwer all the purpoſes of ſuch a canal. Thus the navigation may be carried up much higher than in the ordinary canals with dams and locks. If a canal be made properly and the ſides and bottom plaſtered with a cement that may be made of the ſame earth and clay ſaved in making the trunk, very little water will be requiſite to keep it full. Our author ſuppoſes that a ſtream ſufficient to turn an ordinary mill will be ſufficient to keep it full, even if the canal ſhould be 20 miles long.

To conſtruct a canal of this kind, we muſt make choice of a level as near the head of the river as poſſible; this level muſt be continued for a conſiderable way, ſo that the water may not have the leaſt current, but may abſolutely ſtagnate. Thus the original bed of the river will ſoon be left at a diſtance, and the ſtagnant canal will become higher and higher with reſpect to it, in proportion to the deſcent of the ground or rapidity of the river. Having proceeded this way as far as convenient, the veſſels muſt be let down by a machine (to be afterwards deſcribed) into the bed of the original river, or from one elevated canal to another much lower; perhaps 10, 15, or 20 fathoms.

By this perfect ſtagnation of the water in the canals, there will be no danger of waſhing off the plaſtering from the ſides and bottom, ſo that the only waſte of water will be by evaporation, and what is required for working the machine above mentioned; which, as it is only required at particular times when veſſels are to be raiſed or lowered, muſt be very trifling, and cannot bear any proportion to the conſtant ſupply at the head of the canal.

In order to keep the firſt level eaſily, and for a conſiderable way, it will be neceſſary to avoid the many valleys which are naturally to be met with near the original river, by the deſcent of other ſtreams into it.

Hence canals conſtructed on the plan recommended by our author muſt run out in ſerpentine windings a conſiderable way into the country, which will augment its length greatly beyond that of the original river; and thus a much greater number of people, and larger extent of country, will reap the benefit of it than if it were continued in a ſtraight line. "One inconvenience (ſays our author) attending the old inland navigations that are carried on in or nigh the original rivers, is their being confined within too ſmall a ſpace of land, and where, for the moſt part, there is the leaſt occaſion either for water to water the land, or for manure to enrich the ſoil; whereas, by beginning a canal near the head of a river, and by continuing it on one common level, if the river have any thing of a deſcent, and runs pretty rapid, the original river and its valley is ſoon left, and the canal is removed up into the ſide of the hill, where there is generally moſt occaſion for manure and water both; and the further on it is continued, and the more rapid the river runs the further the navigation is removed from the valley and the original courſe of the river, till it is brought to the place deſigned for the purpoſe of transferring the veſſels down at once by a machine into the original river, the ſea, or into another canal"

Notwithſtanding the advantages which attend this new mode of conſtruction, our author acknowledges that there are ſome caſes in which the old method only can be put in practice.

With regard to the ſize, form and expence of canals of this kind, Mr Leach gives a computation from one which was intended to be made in the county of Cornwall, and which was called the *Tamar* canal. An act of parliament was obtained for this in 1774. A navigable canal was to be made from Bude Haven, in the county of Cornwall on the Briſtol Channel, to the navigable part of the river Tamar; the deſign being to open a communication between the Engliſh and Briſtol Channels through the counties of Devon and Cornwall. By the act, it was determined that the canal ſhould not exceed 63 feet in breadth, nor ſhould the ground be cut more than 39 inches deep below the ſurface, excepting in places where docks or baſons were to be made, or where cranes or other engines were to be erected for particular purpoſes. The breadth allowed (73 feet) was to comprehend the water itſelf, the two towing paths, one on each ſide, and the fences beyond. The breadth of the canal itſelf was to be 21 feet at the ſurface and 12 at bottom; the depth on the under ſide, 39 inches, as already ſaid, the towing paths 12 feet broad each: and beyond theſe an hedge or rail at the diſtance of ſix feet on each ſide from the paths. There were to be drains as uſual in canals; one on the under ſide for carrrying off the ſuperfluous water from the canal, the other on the upper ſide for carrying off the water which might accidentally fall into it in rains, or by ſprings in the higher grounds. Thus the whole would not exceed the breadth propoſed by act of parliament; while the canal itſelf would be ſufficiently large for every neceſſary purpoſe Mr Leach computes, that on this canal two boats, carrying 10 tons each, might very eaſily paſs; and he recommends this as the proper ſize of canals in other parts of the kingdom.

Canals of this kind, our author obſerves, will, for the moſt part, be made in the ſide of an hill or riſing ground; whence the greateſt part of the earth dug out of it will be thrown upon the under ſide. Here it will elevate the ground ſufficiently to form a towing path, together with an elevated ſpace whereon to plant the hedge or fence. On the higher ſide, 12 feet of the ground muſt be cut down to within 18 inches of the ſurface of the water; and the earth and ſtones dug out in making this path will make the fence on the outſide for keeping off the cattle. As by the act of parliament, however, there is a greater breadth allowed in ſome places for making docks or baſons, our author calculates the whole breadth of the canal at 66 feet; and according to this breadth he makes his computations.

1. The firſt and principal expence is the digging of the trunk of the canal; but this muſt vary ſo much according to the nature of the ground, that no certain eſtimate of the expence can be made. Sometimes the ground may be ſoft, and eaſily cut, ſometimes hard and rocky, ſometimes marſhy and boggy, &c. There muſt alſo be a very conſiderable difference in the expence of cutting the canal, according as the ground on one ſide of it is more or leſs elevated. Mr Leach, after making the proper calculations, ſuppoſes that in every perch of a canal of the kind under conſideration, there muſt be removed $40\frac{1}{3}$ cubical yards, or 1085 cubical feet, of earth. Agreements with the workmen are commonly made by the cubic yard. It is rare that a cubic yard can be removed for leſs than 2d. "nor (ſays our author) will any ſort of ground require more than 9d. except in paſſing through a rock, which will not often happen, unleſs where, by the ſituation of the land through which the canal may paſs, it ſhould require to be cut more than four feet under the ſurface, as it may ſometimes happen in cutting through a hill or neck of land, whereby the courſe of the canal may be ſhortened. According to this eſtimate, Mr Leach has formed a table of the expence of making canals from 2d. the cubic yard to 9d. The ſmalleſt expence of theſe per mile is L. 107 : 11s : $1\frac{1}{2}$; the greateſt L. 483 : 19 : 9. Sometimes, however, the expence may be even greater: ſo that the mile may coſt L. 600, or near it; but this muſt be accounted an extraordinary expence, and not often to be expected.

In digging the trunk of the canal, care muſt be taken to preſerve all the ſand, ſtones, and gravel, for the purpoſe of making drains or gutters and the towing paths; alſo for the making of a wall, the outſide face of which is to be 21 feet diſtant from the edge of the canal. The deſign of this is to prevent the earth and rubbiſh from being thrown to too great a diſtance from the ſide of the canal; and likewiſe for the purpoſe of raiſing a bank on the lower ſide about 16 or 18 inches above the ſurface of the water in the canal, when it is full up to the drains. On the top of this bank the towing path is to be made 12 feet wide on that ſide of the canal; and if this wall ſhould be raiſed four feet above the ſurface of the towing path, it would be a fence to keep the cattle off from that ſide. In making the towing path on the other ſide, the ſurface of the land muſt be ſunk to within 16 or 18 inches of the ſurface of the water in the canal when full; and the turf, earth, ſtones, &c. taken from thence in making the towing path on that ſide, will make the other fence of the canal.

2. Drains or gutters muſt be made under the towing paths, on both ſides of the canal. On the upper ſide they muſt be made through the hedge or fence at all convenient places, for admitting ſprings and rivulets, as well as rain water into the canal. On the higher ſide, theſe ſhould be about 132 feet diſtant from one another, excluſive of thoſe for the admiſſion of ſprings. On the lower ſide, it is neceſſary to have drains at the diſtance of 66 feet from each other; which will be 80 drains per mile. Theſe may be conſtructed for 2s. 6d. each, which amounts to L. 10 per mile. On the higher ſide they will coſt about four ſhillings per drain; and at the diſtance of 132 feet betwixt each drain, the expence will be L. 8 per mile.

In making the drains on the lower ſide, great care muſt be taken to have them truly level, and parallel to the horizon; the bottom part of the drain being exactly 39 inches perpendicular above the bottom of the canal; as on the true placing of theſe drains, and the true level of the bottom of the canal, entirely depends the regularity of the deepneſs of the water.

3. The value of the ground through which the canal is to paſs muſt alſo be conſidered. From the obſervations and memorandums which our author took in the year 1774, concerning the ground through which the Tamer canal was to paſs, he concluded that one eighth part of the land through which the tract paſſed was worth 40s. per acre; another eighth, 20s.; a third eighth part, 10s; and all the reſt not worth more than five; and a great deal of it not more than two; the average of the whole being 15s an acre. "Then (ſays he), if the good, indifferent, and bad land be worth on an average, 15s. an acre, and as 30 years value is a capital price for lands, it will at that rate, amount to 22l. 10s. per acre. The ſtipulated breadth of the canal with the towing paths and hedges being, as already ſaid, 66 feet, which is exactly a gunter's chain: then, 10 ſuch chains in length and one in breadth form exactly a ſtatute acre of land; and ten chains in length is a furlong: ſo that every mile of canal will thus take up eight acres of land, which, at 22l. 10s. per acre, amounts to 180l. per mile.

4. Bridges are likewiſe a conſiderable article of expence in the making of canals. Mr leach ſuppoſes that there may be one common road bridge and two ſwivel bridges required per mile; the former may be erected for 60l. and the latter for 30l. each; ſo that the expence of all together will amount to 120l. per mile.

5. As in ſome particular places, on account of ſhort turns, and where docks and baſons and landing places are to be made, a greater wideneſs will be required, our author allows half an acre more land for every furlong on this account; which brings an additional expence of 90l. per mile.

6. It will always be neceſſary to have ſluices for emptying the canal; each of which will coſt 20l. Mr Leach allows a ſluice and ſtop-gate for every mile; and as theſe coſt 20l, each, we have thus a farther expence of 40l. per mile.

7. The wall on the lower ſide againſt the bank of earth and towing path may be built for three ſhillings per perch; and as every mile contains 320 perches, the expence of the wall will be 48l. per mile.

8. Our author calculates the towing path on the lower ſide at the ſame price: ſo that it alſo makes an addition of 48l. per mile; but as he eſtimates the higher towing path and hedge at 8s per perch, this will amount to 128l. per mile.

Thus, according to our author's calculation, the whole expence of making a canal with its neceſſary appendages will amount to L 944 : 13 : 4¾ per mile; and by the calculation of another engineer, the particulars of which he alſo enumerates, it would not exceed L. 1032 : 13 : 4½. This our author thinks a moderate expence; but an objection naturally ocurs from the great lengths to which ſuch canals muſt neceſſarily run; a remarkable inſtance of which he gives in the propoſed Tamar canal, where, though the diſtance betwixt Bude Haven and the navigable part of the river Tamer is no more than 28 miles in a ſtraight line, the length of the canal would not have been leſs than 80 miles. This length, however, according to our author, "ought not to be an object of diſcouragement, but on the contrary an inducement and an encouragement to promote the extending of it as much as poſſible into the country, as it will bring a market to every man's door that it draws nigh in its paſſage, and be a means to improve a greater quantity of uncultivated lands; and the navigation will be thereby much more extenſive, and a much larger number of inhabitants will reap the advantages thereof, than if it had been carried on upon the original river."

We have already taken notice, that in the method of conſtructing canals juſt now mentioned, there will at certain intervals be places where the veſſels muſt be raiſed and lowered by means of mechanical powers, inſtead of the dams and locks made uſe of in other canals. Theſe machines are compounded of an inclined plane and wheel in axis. The inclined plane is a parallelogram whoſe length reaches from the end of one canal to the beginning of another, or to the ſea or navigable river, to which the veſſel is next to be conveyed; the breadth ought to be 22½ feet. It may be made of good oak or deal plank, and ſufficiently ſtrong to bear the weight to be laid upon it; and it muſt be very ſtrongly ſupported by beams of oak or other wood. It ought to be divided in the middle by a ledge or rib of 12 inches ſquare, the ſide ribs being nine by 12 inches. The elevation muſt depend upon particular circumſtances. Fig. 1. ſhows the inclined part of the machine; AB being the wooden part juſt deſcribed, placed between the ſide of the hill W and the navigable river F. According to the dimenſions already given, the two paths A and B on which the veſſels move are exactly ten feet wide. G repreſents the canal, brought perhaps from the diſtance of ſeveral miles to the top of the precipice WW. At the end of the canal, and quite acroſs from R to R, muſt be built a very ſtrong wall; in which are two ſluices with flood-gates at K and L, to let out the water occaſionally. Between the head of the plane AB, and the end of the canal G, is a horizontal platform divided into two parts, as is repreſented in the figure by the letters HI. At the end of the canal are ſix

Plate CCCXXIV.

Inland Navigation.

rollers M and N, of uſe in carrying the boats and lighters in and out of the canal. Near the end of the canal, at S and T, are two other ſluices, with their flood-gates, for letting out a quantity of fluid to drive the other part of the machine. O and P repreſent the two ends of the towing paths, one on each ſide of the canal.

Plate CCCXLIV

Fig. 2. ſhows the vehicle by which the lighters are conveyed up and down the inclined plane, by the two paths A and B, fig. 1. AA (fig. 2.) repreſents part of the inclined plane, B the vehicle in the poſition in which it rolls up and down the paths. C is the body of the vehicle, which is made hollow, to contain a quantity of water occaſionally uſed as a counterbalance for its correſponding vehicle. DDD are three rollers between the bottom of the vehicle and the plane, for the purpoſe of rolling the boats up and down. HHHH are ſix rollers; four on the horizontal part of the vehicle on which the boat E is to reſt in its paſſage up and down the plane; the other two rollers are in a moveable part, which is faſted to the body of the vehicle with a pair of very ſtrong hinges; and in the paſſage of the vehicle up and down the plane it turns up between the head of the boat and the plane, preventing the former from rubbing againſt the plane. When the vehicle gets up to the top, this moveable part falls down on the platform marked HI, becoming parallel with the horizontal part of the vehicle; after which it ſerves as a launch and paſſage to place the boat upon the rollers MN (fig. 1.) at the end of the canal. This paſſage part of the vehicle, together with the three rollers at the end of the canal, is likewiſe of great uſe in towing a boat out of the canal, in order to place it on the horizontal part. At the bottom of the cavity of the vehicle is a large hole F, with a valve opening inwardly. Through this hole the water enters when the vehicle, ſinks into the navigable river F, for the purpoſe of receiving a boat on the top or horizontal part of the vehicle till it is quite full; and will then ſink entirely under water, while the boat is towed in on the horizontal part. A ſmall rope K is faſtened to the valve, on purpoſe to lift it up, and to keep it ſo while the vehicle and boat are aſcending up the plane out of the canal, that ſo the water may diſcharge itſelf till as much as is neceſſary be got out; or till it becomes an equal balance for the correſponding vehicle and its contents, which are deſcending by the other path. Hence we ſee, that every machine muſt have two of thoſe vehicles furniſhed with rollers as already deſcribed, and ſo conſtructed that one may be as nearly as poſſible a counterbalance to the other. As it is neceſſary that the vehicles ſhould be water tight, the inſides, of them muſt be caulked very tight; and they ſhould be capacious enough to hold as much water as will balance the largeſt boat with its contents. Here it may be obſerved, that every veſſel will be balanced by as many cubic feet of water as it diſplaces by being put into the water when loaded The quantity may eaſily be known, by obſerving how far the boat ſinks in the water, and calculating the bulk of the part immerſed.

The machine which puts the vehicles in motion, may either be conſtructed with an under ſhot or breaſt-water-wheel; by an over-ſhot water-wheel; or by two walking-wheels, for men to walk in as in cranes, &c.

Fig. 3. ſhows a front view of the under-ſhot water-wheel movement: where A is the end of the axis or cylinder of the cog or ſpur-wheel; the diameter of which axis is four feet, and its length not leſs than 22 feet, as it muſt be extended quite acroſs the canal from one ſide to the other, and placed on the top of very ſtrong ſupporters on each ſide of the canal, about ſeven feet above the ſurface of the water, as the loaded boat is to paſs backwards and forwards under the cylinder, and at a convenient diſtance from the wall RR (fig. 1.) and placed between the two ſluices S and T; on the end of which cylinder is the cog-wheel B (fig. 3.) The wheel B is ſuppoſed to be 20 feet in diameter, having on its edge 120 cogs: and underneath the cog wheel is the breaſt-water one, C, 24 feet in diameter from the tip of one aller-board to the tip of its oppoſite. On the end of the axis of the water-wheel D is a trundle two feet and an half in diameter, with 15 rounds or ſtaves contained therein. This muſt be placed between the two ſluices S and T, to let the water out of the canal; which, falling on the float-boards, will turn the wheel round from the right hand towards the left, when the ſluice on the left hand of the wheel is opened; but the contrary way when that on the right is opened—The water falling upon the boards paſſes along with the wheel in the circular cavity EGF, and is diſcharged at G, whatever way the wheel may turn.

To the axis or cylinder of this machine, which muſt always be horizontal, are fixed two pair of ſtrong ropes; the ends of each pair faſtened to the upper part of the cylinder; it being neceſſary that they ſhould act in contrary directions. Each muſt extend the whole length of the plane, and their ſtrength muſt be proportioned to the weight neceſſary to be ſuſtained. The two vehicles already mentioned are faſtened to the other ends of the ropes; ſo that one pair of the ropes are wound up by the cylinder turning one way, and the other by its turning the contrary way. Thus, when one of the vehicles is at the upper part of the path A, ready to diſcharge its boat and cargo into the upper canal, the other boat will be at the foot of the path B, all under water in the lower canal, and ready for the reception of a boat to be towed in on the horizontal part of it; ſo that as one vehicle rolls up on one ſide of the plane, the other will roll down on the other ſide, and *vice verſa*.

Fig. 1.

Fig. 4. ſhows the movement by means of an over-ſhot water-wheel. It conſiſts of a water-wheel C, and two ſpur or cog-wheels A and B. The water-wheel is 18 feet in diameter, and has two rows of buckets placed contrariwiſe to one another, that it may turn round in contrary directions, according as the one or the other ſluice, S or T, is opened. On its axis F is a trundle of three feet diameter, having 18 rounds or ſtaves which fall into the cogs of the ſecond ſpur-wheel B, cauſing it to turn round in a direction contrary to that of the water-wheel. This ſecond wheel is likewiſe 18 feet in diameter, with a trundle of three feet, having 18 rounds or ſtaves.—The diameter of the upper ſpur-wheel A is alſo 18 feet, but the diameter of its axis is ſix feet. On the edge of the wheel are 108 cogs. Theſe fall in between the ſtaves of the axis of the other ſpur-wheel; and thus the third wheel turns round the ſame way with the water-wheel C. The cylinder of this upper ſpur-wheel muſt be placed acroſs the canal betwixt the two ſluices, on very ſtrong ſupporters, as explained in the former movement, and the two pair of ropes in the ſame manner.

Plate cccxiv.

The movement of the walking-wheel is ſhown (fig. 5.) A1 and A2 are two wheels for men to walk in, each of them 24 feet in diameter. B1 and B2 are the axes or cylinders of the two wheels, of equal lengths; viz. 11 feet each, and four in diameter.— At one end of each of the two cylinders C1 and C2, is a wheel of the ſame diameter with the cylinder. On the edges of theſe wheels are teeth of an equal number in each wheel; and as the teeth of the wheels mutually fall into each other, the revolutions of both muſt be performed in the ſame time. By this contrivance alſo the cylinders will turn different ways; and the ropes on the two different cylinders will conſtantly one pair be wound up, and the other wound down, by the natural moving of the machine. DDD is the frame that ſupports the whole, which muſt be made very firm and ſecure.

Let us now ſuppoſe, that there is a boat in the upper canal to be brought down, but none to go up for a balance. In this caſe, as one of the vehicles muſt be at the top to receive the boat, the other will be at the bottom to take in water. Let then any of the movements juſt deſcribed be ſet to work, and it is plain, that as the upper vehicle with its boat deſcends, the under vehicle will aſcend with the water; the valve being in the mean time lifted up till a ſufficient quantity of water has flowed out, to make the one nearly a counterbalance to the other; ſo that the veſſel may ſlide down gently and without any violence.

If it happens that a boat is to go up while none is to come down, one of the vehicles being at the foot of the plane under water, and in readineſs to have the boat towed upon its horizontal part, one of the ſluices at K or L is to be opened, and a quantity of water let into the ciſtern of the upper vehicle ſufficient to counterbalance the boat with its contents which is to aſcend. This being done, the machine is ſet to work, the valve of the under vehicle kept open till the water is all diſcharged; and then the boat will roll up to the top of the plane

From this deſcription of the canal and machinery for raiſing and lowering the veſſels, the reader can be at no loſs to underſtand the principles on which it depends. It would be ſuperfluous to adduce examples, or follow our author through his calculations relative to particular caſes. We ſhall only obſerve, that the difference of time in which veſſels may be raiſed or lowered by the machinery juſt deſcribed, in compariſon with what can be done in the common way by dams and locks, muſt give a very favourable idea of the new method. According to Mr Leach's computations, a boat with its cargo weighing 10 ton might be raiſed by the walking-machine in 12 or 14 minutes, by the underſhot-wheel in 15 minutes, and by the overſhot-wheel in 30 minutes; and that through a ſpace of no leſs than 30 fathoms meaſured on the inclined plane, or 114 feet perpendicular.

NAULUM, a piece of money put into the mouth of a perſon deceaſed among the Romans, to enable him to pay Charon the ferryman for his paſſage. It was to be of the current coin of the reigning emperor: from this money then the time of the perſon's death may be known. The ſum for poor men was a farthing, but the rich in general were very liberal to the old tar Charon, as appears from the number of coins often found in the neighbourhood of Rome on opening the graves of great men. Charon was looked upon as a very moroſe and obſtinate old fellow, who would not carry over any man without his fare; and hence the proverbial uſe of that verſe in Juvenal,

[illegible]

A ſimilar cuſtom took place among the Greeks; but the money put into the mouth of the deceaſed was called Δανακη.

NAUMACHIA, in antiquity, a ſhow or ſpectacle among the ancient Romans, repreſenting a ſea fight. Theſe mock ſea-fights are ſuppoſed to have originated at the time of the firſt Punic war, when the Romans firſt inſtructed their men in the knowledge of naval affairs. Afterwards they were intended to entertain the populace, as well as to improve the ſeamen. They were often like other ſhows exhibited at the expence of individuals, to increaſe their popularity.

In theſe ſpectacles they ſometimes ſtrove to excel each other in ſwiftneſs; and ſometimes engaged in a warlike manner. The Naumachiæ of Claudius indeed was a moſt ſavage diverſion. The combatants uſed to deſtroy each other to amuſe a tyrant and a cruel mob. As they paſſed before him, they uſed this melancholy greeting, "*Ave Imperator, morituri te ſalutant.*" The emperor replied, "*Avete vos.*" This they underſtood as an anſwer of kindneſs, and a grant of their lives: but they ſoon diſcovered that it proceeded from wanton cruelty, and barbarous inſenſibility. In the time of the emperor Domitian, ſuch a vaſt number of veſſels engaged as would have nearly formed two regular fleets for a real fight, and the channel of water was equal in magnitude to a natural river. The emperor Heliogabalus is reported to have filled the channel where the veſſels were to ride with wine inſtead of water. Tritons and ſea-monſters were frequently exhibited during the engagement. Suetonius and Dio Caſſius inform us, that at one of theſe ſea-fights of Domitian a violent ſhower fell; the emperor, however, continued till the end of the engagement, often changing his clothes, nor would he ſuffer any one to depart; and as the rain continued for ſeveral hours, many were ſeized with diſtempers, and ſome even died, Suet. cap. 4. Dio, lib. lxvii. Naumachiæ were alſo places fitted up for theſe ſhows, a ſort of circus's or amphitheatres, with ſeats and porticos, &c.: there were ſeveral of them at Rome; three built by Auguſtus, one by Claudius, another by Domitian, and another by Nero; which ſerved for the reverſe of his medals. Claudius uſed the lake Fucinus as a Naumachia.

NAUMBURG, a town of Germany, in the circle of Upper Saxony, capital of the county of Saxe-Naumburg, ſituated on the river Sala, in E. Long. 11. 20. N. Lat. 51. 12.

NAUPACTUS, or NAUPACTUM, (anc. geog.) a city of Ætolia, at the mouth of the Evenus. The word is derived from ναυς and πηγνυμι, becauſe it was there that the Heraclidæ built the firſt ſhip which carried them to Peloponneſus. It firſt belonged to the Locri Ozolæ, and afterwards fell into the hands of the Athenians, who gave it to the Meſſinians, who had been driven from Peloponneſus by the Lacedemonians. It became the property of the Lacedemonians after the battle of Ægoſpotames, and it was reſtored to the Locri. Philip of Macedonia afterwards took it, and gave it to the Ætolians; from which circumſtance it has generally been called one of the chief cities of their country. E. Long. 22. 20. N. Lat. 38. 0.

There was on the ſhore a temple of Neptune, and near it a cave filled with offerings, and dedicated to Venus, where widows reſorted to requeſt new huſbands of the goddeſs. Pauſan. lib. 10. p. 898.

NAUPLIA, (anc. geog.), a maritime city of Peloponneſus. It was the naval ſtation of the Argives. The fountain Canathos was in its neighbourhood.

NAUPLIUS, (fab. hiſt.), a ſon of Neptune and Amymone, king of Eubœa. He was the father of the famous Palamedes, who was ſo unjuſtly ſacrificed to the artifice and reſentment of Ulyſſes by the Greeks at the Trojan war. The death of Palamedes highly enraged Nauplius; and to revenge the injuſtice of the Grecian princes, he endeavoured to debauch their wives, and ruin their characters. When the Greeks returned from the Trojan war, Nauplius was pleaſed to ſee them diſtreſſed in a ſtorm on the coaſts of Eubœa; and to make their diſaſter ſtill more univerſal, he lighted fires on ſuch places as were ſurrounded with the moſt dangerous rocks, that the fleet might be ſhipwrecked upon the coaſt. This had the deſired effect; but Nauplius was ſo diſappointed when he ſaw Ulyſſes and Diomedes eſcape from the general diſtreſs, that he threw himſelf into the ſea. According to ſome mythologiſts there were two perſons of this name, a native of Argos, who went to Colchis with Jaſon. He was ſon of Neptune and Amymone.—The other was king of Eubœa, and lived about the time of the Trojan war. He was, as ſome obſerve, ſon of Clytonas, one of the deſcendants of Nauplius the Argonaut. The Argonaut was remarkable for his knowledge of ſea affairs and of aſtronomy. He built the town of Nauplia, and ſold Auge daughter of Aleus to king Teuthras, to ſcreen her from her father's reſentment.

NAUPORTUS, or NAUPORTUM, (anc. geog.), a town on a cognominal river, towards its ſource, in Pannonia Superior. The reaſon of the name, according to Pliny, is, that the ſhip Argo, after coming up the Danube, the Save, and the Laubach, was thence carried on mens ſhoulders over the Alps into the Adriatic. The river Nauportus riſes in the Alps, near Longaticum, at the diſtance of ſix miles from the town Nauportum; which was a colony of the Taurisci, a people on the confines of Noricum. Now *Upper Laubach* in Carinthia, on the river Laubach. E. Long. 14. 40. N. Lat. 46. 28.

NAUSCOPY, the art of diſcovering the approach of ſhips or the neighbourhood of land at a conſiderable diſtance. This pretended art was invented by a M. Bottineau, employed in the King and Company's ſervice in the iſland of France, from the year 1782 to 1784; and the account of it is given by the inventor as follows:

"This knowledge is not derived either from the undulation of the waves, or from the ſubtilty of ſight, nor from any particular ſenſation; but merely from obſervation of the *horizon*, which diſcovers ſigns indicating the proximity of ſhips or of land.

"On the *approximation* of a ſhip towards the land, or towards another ſhip, there appears in the atmoſphere a *meteor* of a particular nature, viſible to every one without any *painful attention*. It is not by any kind of accident that this meteor appears under theſe circumſtances; on the contrary, it is the neceſſary reſult of the approximation of one veſſel towards another, or towards the land. The exiſtence of the *meteor*, and the knowledge of its different modifications, are what conſtitute the certainty and the preciſion of my informations.

"If I am aſked, how it is poſſible that the approach of a ſhip towards land ſhould give birth to any *meteor* whatſoever in the atmoſphere, and what connection there can be between two objects at ſuch a diſtance from each other? I reply, that I am not obliged to give an account of the *hows* and the *wherefores*; that it is ſufficient for me to have diſcovered the fact, without being obliged to account for its principle."

The writer concludes, by deſiring to be called on for experimental proofs, and by promiſing in future a complete treatiſe of Nauſcopy, with maps, plates, &c.

This complete treatiſe, as far as we know, has not yet been publiſhed, nor do we expect ever to ſee ſuch a treatiſe on the ſubject as will ſatisfy the minds of thoſe who are perſuaded that every effect muſt have an adequate cauſe. The adminiſtrators of the iſland, who gave to M. Bottineau what he calls a *report*, containing the moſt authentic and moſt explicit teſtimony of the reality of the diſcovery, ſeem to be of our opinion; and yet they ſpeak of this diſcovery with doubt, and with a degree of reſpect to which we think it can lay no claim. Their report is in the form of a letter directed to the *Marechal de Caſtries*: and that our infidelity may not deprive the public of what, in the immenſe catalogue of poſſibilities, *may* lead to a uſeful diſcovery, we ſhall here ſubjoin a copy of it.

Port Louis, Iſland of France, the 18th February 1784.

"My Lord, A letter which you have written on the 6th of April to M. Bottineau, employed in the King and Company's ſervice in this colony, obliges us not to refuſe him one for you, of which he propoſes being himſelf the bearer. The deſire only of being uſeful to his country, is (as he ſays) the motive which determines him to take this ſtep. He would be angry with himſelf were he to conceal a diſcovery which hath hitherto eſcaped the moſt enlightened perſons, and of which he only is in poſſeſſion. This diſcovery is the art of announcing the preſence of one or ſeveral ſhips, at 100, 150, and as far as 200 leagues diſtance. This is by no means the reſult of his ſtudies, nor the fortunate application of the principles of any particular ſcience; his ſcience is in his eyes only, and he can have no other; what we call *penetration* and *genius* cannot make up to him what he is deficient in from education. He perceives (as he ſays) in nature, ſome ſigns which indicate to him the preſence of the veſſels, as we know that there is a fire in a place when we perceive the ſmoke which comes from it. This is the compariſon which he makes uſe of himſelf to thoſe who have converſed with him about his art; this (though he has kept his ſecret to himſelf)

Fig. 1

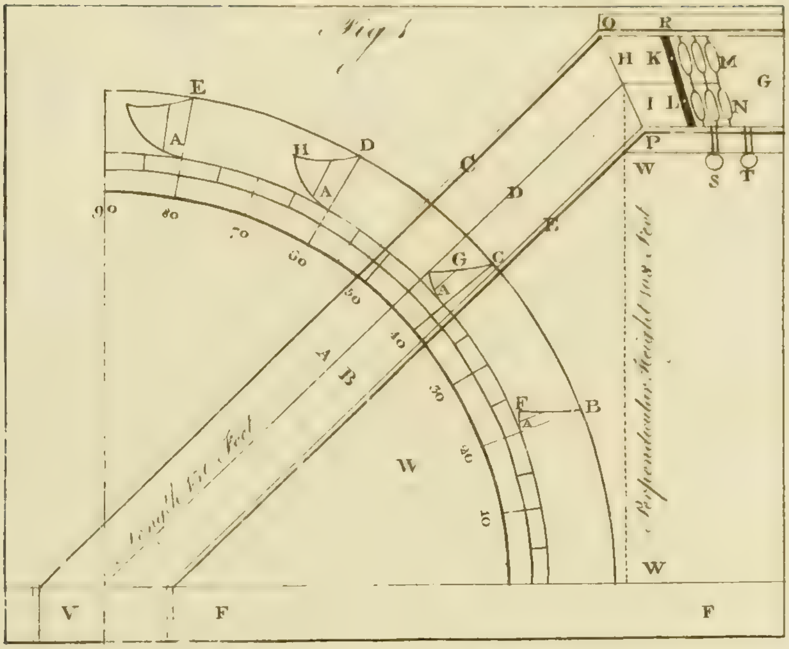


Fig. 2

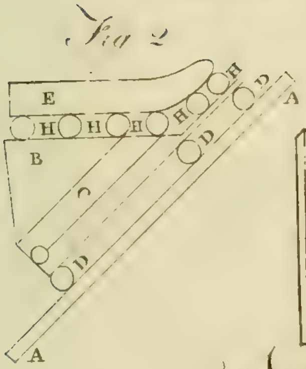


Fig. 3

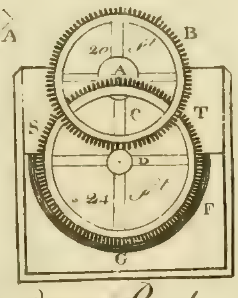


Fig. 4

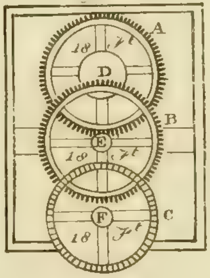
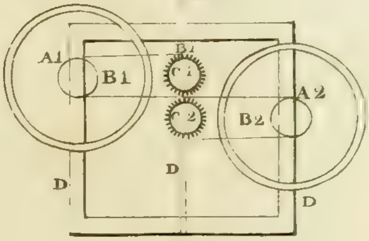


Fig. 5



Napiers Rods

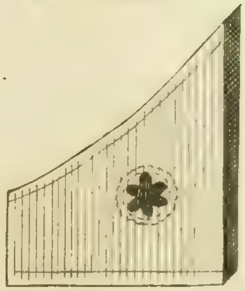
No. 1

1	1	2	3	4	5	6	7	8	9	0
2	/2	/4	/6	/8	1/0	1/2	1/4	1/6	1/8	/0
3	/3	/6	/9	1/2	1/5	1/8	2/1	2/4	2/7	/0
4	/4	/8	1/2	1/6	2/0	2/4	2/8	3/2	3/6	/0
5	/5	1/0	1/5	2/0	2/5	3/0	3/5	4/0	4/5	/0
6	/6	1/2	1/8	2/4	3/0	3/6	4/2	4/8	5/4	/0
7	/7	1/4	2/1	2/8	3/5	4/2	4/9	5/6	6/3	/0
8	/8	1/6	2/4	3/2	4/0	4/8	5/6	6/4	7/2	/0
9	/9	1/8	2/7	3/6	4/5	5/4	6/3	7/2	8/1	/0

No. 2

1	4	7	6	8
2	/8	1/4	1/2	1/6
3	1/2	2/1	1/8	2/4
4	1/6	2/8	2/4	3/2
5	2/0	3/5	3/0	4/0
6	2/4	4/2	3/6	4/8
7	2/8	4/9	4/2	5/6
8	3/2	5/6	4/8	6/4
9	3/6	6/3	5/4	7/2

Nebel



R. Scot & S. Warner sc.

Naufcopy.

ſelf) is the plaineſt thing he has ſaid, in order to make it be underſtood that he hath not made this diſcovery by the knowledge of any art or ſcience, which had been the object of his application, or of his former ſtudies.

"It is according to him the effect of chance; he hath taken nature in the act, and hath diſcovered his ſecret; ſo that his ſcience, or rather the firſt elements of it, hath not coſt him the leaſt trouble: but the thing which hath coſt him a great deal of labour, and which may be really called his own, is the art of judging of the exact diſtance.

"According to him, the ſigns very clearly indicate the preſence of ſhips; but none but thoſe who can well read theſe ſigns can draw any concluſions from them with regard to diſtances; and this art of reading them well, is, according to him, a true and a very laborious ſtudy: for this reaſon he hath himſelf, for a very long time, been the dupe of his ſcience. It is at leaſt 15 years ſince he firſt foretold here the arrival of ſhips. At firſt this was regarded only as a frolic. Wagers were laid on both ſides. He often loſt, becauſe the ſhips did not arrive at the time preſcribed by him. From thence came his application to find out the cauſe of theſe miſtakes; and the perfection of his art is the reſult of this application.

"Since the war, his informations have greatly increaſed, and probably were ſufficiently exact to excite the attention of the public. The noiſe of them reached us with the degree of enthuſiaſm which is always excited by the marvellous. He himſelf ſpoke of the reality of his ſcience with the tone of a man convinced. It would have been too cruel to have diſmiſſed him as a viſionary.

"Beſides, every thing depended upon proofs, and we required that he ſhould produce ſome: in conſequence, he hath regularly ſent us, for eight months, the informations which he thought he might venture to ſend us; and the reſult is, that ſeveral of the ſhips he announced are arrived at the time he foretold, after ſeveral days of information.

"Others have come later than was expected, and ſome have not appeared at all.

"With regard to ſome of theſe, it hath been aſcertained, that their delay had been occaſioned by calms or by currents. M. Bottineau is perſuaded, that thoſe which never appeared were foreign veſſels which went on; and accordingly we have learned, that ſome Engliſh ſhips were arrived in India, which might perhaps have been in ſight of the iſland at the time indicated. But this is no more than a conjecture, which our occupations have not allowed us to inveſtigate. What we can aſcertain is, that in general it appears that M. Bottineau hath made juſt obſervations: whether it is owing to chance or to his abilities, it might be, perhaps, imprudent to determine. It is however certain, that the fact is ſo extraordinary, under whatever light it is conſidered, that we have not thought ourſelves able either to affirm or deny it: and we have wiſhed the Sieur Bottineau to compel us to take one or the other ſide of the queſtion, by truſting his ſecret to ſome truſty and able perſon.—But this he hath refuſed, being probably afraid that he ſhould not acquire by the diſcovery all the benefit which he imagines he may reap from it.

"Suppoſing the reality of the diſcovery, we do not believe that its utility can be as important as M. Bottineau perſuades himſelf it is; but it might perhaps throw a great light upon natural hiſtory. In order to be uſeful, it would be neceſſary that the diſcovery ſhould be confined to one nation, and remain unknown to all others. This will be impoſſible, if every fleet, every veſſel, and every privateer, is obliged to carry a man on board who is in poſſeſſion of this ſecret.—We remain, with reſpect, my Lord, yours, &c. Le V^te^. de Souilliac, chevreau."

Nauſea, Nautilus.

NAUSEA, or SICKNESS; a retching or propenſity and endeavour to vomit, ariſing from ſomething which irritates the ſtomach.

NAUTILUS, in zoology; a genus belonging to the order of vermes teſtacea. The ſhell conſiſts of one ſpiral valve, divided into ſeveral apartments by partitions. There are 17 ſpecies, chiefly diſtinguiſhed by particularities in their ſhells.

Bonanni obſerves, that this genius of ſhell-fiſh is very well named from the Greek ναυτιλος, which ſignifies both "a ſhip" and "a ſailor;" for that the ſhells of all the nautili carry the appearance of a ſhip with a very high poop. Different authors, both ancient and modern, have called the nautilus by the names of *pompilus*, *nauplius*, *nauticus*, *ovum polypi*, *polypus teſtaceus*: and the French call it *le voilier*. It is by ſome imagined, that men firſt learned the art of navigation from this animal.

The moſt remarkable diviſion of the nautili is into the thin and thick-ſhelled kinds. The firſt is called *nautilus papyraceus;* and its ſhell is indeed no thicker than a piece of paper when out of the water. This ſpecies is not at all faſtened to its ſhell: but there is an opinion, as old as the days of Pliny, that this creature creeps out of its ſhell, and goes on ſhore to feed. When this ſpecies is to ſail, it expands two of its arms on high, and between theſe ſupports a membrane, which it throws out on this occaſion; this ſerves for its ſail, and the two other arms it hangs out of its ſhell, to ſerve occaſionally either as oars or as a ſteerage; but this laſt office is generally ſerved by the tail. When the ſea is calm, it is frequent to ſee numbers of theſe creatures diverting themſelves in this manner: but as ſoon as a ſtorm riſes, or any thing gives them diſturbance, they draw in their legs, and take in as much water as makes them ſpecifically heavier than that in which they float; and then they ſink to the bottom. When they riſe again, they void this water by a number of holes, of which their legs are full. The other nautilus, whoſe ſhell is thick, never quits that habitation. This ſhell is divided into 40 or more partitions, which grow ſmaller and ſmaller as they approach the extremity or centre of the ſhell: between every one of theſe cells and the adjoining ones there is a communication by means of a hole in the centre of every one of the partitions. Through this hole there runs a pipe of the whole length of the ſhell. It is ſuppoſed by many, that by means of this pipe the fiſh occaſionally paſſes from one cell to another; but this ſeems by no means probable, as the fiſh muſt undoubtedly be cruſhed to death by paſſing through it. It is much more likely that the fiſh always occupies the largeſt chamber in its ſhell; that is, that it lives in the cavity between the mouth and the firſt parti-tion,

Nautilus, Navy.

tion, and that it never removes out of this; but that all the apparatus of cells, and a pipe of communication which we ſo much admire, ſerves only to admit occaſionally air or water into the ſhell, in ſuch proportion as may ſerve the creature in its intentions of ſwimming.

Some authors call this ſhell the *concha margaritifera*: but this can be only on account of the fine colour on its inſide, which is more beautiful than any other mother-of-pearl; for it has not been obſerved that this ſpecies of fiſh ever produced pearls. It muſt be obſerved, that the polypus is by no means to be confounded with the paper-ſhelled nautilus, notwithſtanding the great reſemblance in the arms and body of the incloſed fiſh; nor is the cornu ammonis, ſo frequently found foſſile, to be confounded with the thick-ſhelled nautilus, though the concamerations and general ſtructure of the ſhell are alike in both: for there are great and eſſential differences between all theſe genera. There is a pretty copious and minute account of this curious animal in the Gentleman's Magazine, vol. xxii. p. 6. 7. 8. and 301. and vol. xxv. p. 128.

NAVY, the fleet or ſhipping of a prince or ſtate. See Marine.

The management of the Britiſh navy-royal under the lord high admiral of Great Britain, is entruſted to principal officers and commiſſioners of the navy, who hold their places by patent. The principal officers of the navy are four, viz. the treaſurer, whoſe buſineſs it is to receive money out of the exchequer, and to pay all the charges of the navy, by warrant from the principal officers: comptroller, who attends and controuls all payment of wages, is to know the rates of ſtores, to examine and audit all accounts, &c.: ſurveyor, who is to know the ſtates of all ſtores, and ſee wants ſupplied; to eſtimate repairs, charge boatſwains, &c. with what ſtores they receive, and at the end of each voyage to ſtate and audit accounts: clerk of the acts, whoſe buſineſs it is to record all orders, contracts, bills, warrants, &c.

The commiſſioners of the navy are five: the firſt executes that part of the comptroller's duty which relates to the comptrolling the victualler's accounts; the ſecond, another part of the ſaid comptroller's duty relating to the account of the ſtorekeepers of the yard; the third has the direction of the navy at the port of Portſmouth; the fourth has the ſame at Chatham; and the fifth at Plymouth. There are alſo other commiſſioners at large, the number more or leſs according to the exigencies of public affairs; and ſince the increaſe of the royal navy, theſe have ſeveral clerks under them, with ſalaries allowed by the king.

The victualling of the royal navy hath formerly been undertaken by contract; but is now managed by commiſſioners, who hold their office on Tower-hill, London. The navy-office is where the whole buſineſs concerning the navy is managed by the principal officers and commiſſioners.

The royal navy of Great Britain is now in a very flouriſhing ſtate, having been diligently kept up in late reigns, as the natural ſtrength of the kingdom. When it is complete, it is divided into three ſquadrons, diſtinguiſhed by the colours of the flags carried by the reſpective admirals belonging to the ſame, viz. *red*, *white*, and *blue*; the principal commander of which bears the title of *admiral*: and each has under him a vice-admiral and a rear-admiral, who are likewiſe flag-officers.

Navy Naxia.

Navy Exerciſe. See Exercise.

Navy-Diſcipline, or *Regulations*. See *Maritime-State*.

NAWORTH-castle, in Cumberland, 10 miles from Carliſle, near the Gelt. This caſtle is ſtill entire and inhabited. It is a large pile, ſquare, and built round a court. On the north it ſtands over the river Ithing, at a great height, the banks ſhagged with wood. The whole houſe is a very irregular building, the rooms numerous, acceſſible by 16 ſtaircaſes, with moſt frequent and ſudden aſcents and deſcents, &c.— The great hall has a gallery at one end, adorned with four vaſt creſts carved in wood, viz. a griffin and dolphin, with the ſcollops; an unicorn, and an ox with a coronet round his neck. In front is a figure in wood of an armed man; two others, perhaps vaſſals, in ſhort jackets and caps; a pouch pendant behind, and the mutilated remains of Priapus to each; one has wooden ſhoes. Theſe ſeem the *ludibrium aulæ* in thoſe groſs days. The top and upper end of the room is painted in ſquares, to the number of 107, repreſenting the Saxon kings and heroes. The chimney here is five yards and a half broad. Within this is another apartment, hung with old tapeſtry, a head of Ann of Cleeves; on one ſide of her a ſmall picture of a lady in full length, &c. and many others. Many of theſe paintings were brought from Kirk-Oſwald-caſtle when that was demoliſhed. The chapel has a ceiling, and part of its wainſcot of the ſame kind, being paintings of Patriarchs, Jewiſh kings, &c. It has a floor of plaſter of Paris, as have ſome other of the rooms. Some of the apartments are very large and ſpacious. The ſmall Popiſh chapel is above ſtairs, and joining to this chapel is the library, which has a wooden roof; the books are old, there are not above one or two of the manuſcripts here now. This caſtle was built by one of the Dacre's, about the reign of Henry III. In the garden walls were ſtones with Roman inſcriptions, which the late earl of Carliſle gave to Sir Thomas Robinſon, and were by him removed to his muſeum at Rookſby: On one of theſe ſtones is this inſcription, *peditum centum quinquaginta Britannorum*; whence it appears that the Romans, when in poſſeſſion of Britain, ſometimes indulged the national troops with the favour of garriſoning their own territories.

NAXIA, or Naxos, a conſiderable iſland of the Archipelago, 25 miles in length, and 88 in circumference. The whole iſland is covered with orange, olive, lemon, cedar, citron, pomegranate, fig, and mulberry trees; and there are a great many ſprings and brooks. This iſland has no harbour; and yet they carry on a conſiderable trade in barley, wine, figs, cotton, ſilk, flax, cheeſe, ſalt, oxen, ſheep, mules, and oil. They burn only oil of maſtic, though olive-oil is exceeding cheap. It is inhabited both by Greeks and Latins, who live in great dread of the Turks; for when the meaneſt of their ſhips appear here, they always wear red caps like galley-ſlaves, and tremble before the loweſt officer; but as ſoon as they are gone, they put on their caps of velvet. The ladies are ſo vain, that when they return out of the country, they have 40 women in their train, half on foot and half on aſſes; one of whom carries a napkin or two, another a petticoat, another a pair of ſtockings, and ſo on; which is a very ridiculous ſight to ſtrangers. There are four archbiſhops ſees in this iſland, and a great many villages; but ſo thin of people, that the whole iſland does not contain above 8000 inhabitants. The higheſt mountain is *Zia*, which ſignifies "the mountain of Jupiter." There are but few antiquities, except ſome ſmall remains of the temple of Bacchus. Some ſay they have mines of gold and ſilver; however, there is one of emery, which is ſo common here, and ſo cheap, that the Engliſh often ballaſt their ſhips therewith.

Naxos, or *Naxia*, a conſiderable town, and capital of the iſle of Naxos, over-againſt the iſle of Paros, with a caſtle and two archbiſhops ſees, the one Greek and the other Latin. The greateſt part of the inhabitants are Greeks. E. Long. 25. 51. N. Lat. 37. 8.

NAXUS, now Naxia, formerly *Strongyle*, *Dia*, *Dionyſias*, *Callipolis*, and *Little Sicily*. It was called *Strongyle*, from a Greek word, ſignifying "round," though in reality it is rather ſquare than round. The names of *Dia* or *Divine*, and *Dionyſias*, were given it as being conſecrated in a peculiar manner to the fabulous god Dionyſus or Bacchus. The appellation of *Callipolis* Pliny and Solinus derive from the metropolis of the iſland, formerly a moſt beautiful city, which is the import of the word Callipolis. The great fertility of the country gave riſe to the name of *Little Sicily*, Naxus being the moſt fruitful of all the Cyclades, as Agathemerus informs us, and no leſs fertile than Sicily itſelf. As for the name of *Naxus*, ſome aſſert that it was borrowed from one Naxus, under whoſe conduct the Carians poſſeſſed themſelves of the iſland; others pretend it received its name from Naxus, the ſon of Endymion. Stephanus, Suidas, and Phavorinus, derive the name of *Naxos* from the Greek word *naxai*, ſignifying "to ſacrifice," and will have it to have been ſo called from the many ſacrifices offered here to Bacchus. With theſe Bocchart agrees, as to its being called *Naxos* from the ſacrifices performed here in honour of Bacchus, but will have the word *naxos* to be a corruption of the Phenician [illegible], or [illegible], ſignifying "a ſacrifice, offering." Naxos is, according to Pliny, 75, but reckoned by the preſent inhabitants 100, miles in compaſs. It has Paros to the weſt, Myconos and Delos to the north, and Ios to the ſouth. This iſland is the moſt fruitful of the Archipelago, and was formerly famed for the excellent wine it produced. Archilochus, as quoted by Athenæus, compares them to the nectar of the gods; and Aiclepiades, cited by Stephanus, aſſures us, that Bacchus took more delight in Naxos than in any other place whatſoever, having himſelf taught the inhabitants to cultivate their vines. The wine of Naxos maintains to this day its ancient reputation, being by ſome deemed the beſt of the Levant. Beſides wine, this iſland abounds with all ſorts of delicious fruits, the plains being covered with orange, olive, lemon, cedar, citron, pomegranate, mulberry, and fig trees. It was formerly famous for quarries of that ſort of marble which the Greeks called *ophites*, from its being green, and ſpeckled with white ſpots like the ſkin of a ſerpent. The beſt emerald is found here on the mountains near the weſtern coaſt, whence the neighbouring cape is called by the Italians *capo ſmeriglio*, or the emerald cape. As to the inhabitants of Naxos, Diodorus relates that the iſland was firſt peopled by the Thracians. Theſe were in a little time ſubdued by a body of Theſſalians, who having poſſeſſed the iſland for the ſpace of 200 years and upwards, were compelled to abandon it by a drought and famine.

After the Trojan war, the Carians ſettled here and called the iſland *Naxos*, from their king, who was the ſon of Polemon. He was ſucceeded by his ſon Leucippus, and Leucippus by his ſon Smardius, in whoſe reign Theſeus, coming out of Crete, landed here with Ariadne, whom he was, in his ſleep, commanded by Bacchus to leave in this iſland. In proceſs of time a colony of Cnidians and Rhodians ſettled here under the conduct of Hippothous and Xuthus; the laſt of all the Ionians, who, in time, poſſeſſed the whole iſland; whence the Naxians are, by Herodotus, called *Ionians*, and ranked among the Athenian colonies. E. Long. 26. 5. N. Lat. 36. 30. It is about 105 miles in circumference and about 30 broad.

Naxus, (anc. geog.), a town of Crete, famous for its hones, called *lapis Naxius*. Another of Sicily, built by the Chalcidian; ſituated on the ſouth ſide of Mount Taurus, deſtroyed by Dionyſius the tyrant; from whoſe ruins Tauromenium, built by Timoleon, either aroſe or was increaſed, (Plutarch).

NAYLOR (James), a noted Engliſh enthuſiaſt, was born, about 1616, in the pariſh of Ardeſley, not far from Wakefield in Yorkſhire. His father, though a farmer, and the proprietor of an eſtate, gave his ſon but a mean education; which is perhaps to be regretted, for his parts were very conſiderable. He married when very young and ſettled in Wakefield pariſh. In 1641, he was a private ſoldier under Lord Fairfax, being then a preſbyterian: but he afterwards became an independent, and was made quarter-maſter under General Lambert. In 1651-2, he was converted by George Fox the apoſtle of the quakers, and ſoon commenced a preacher and prophet among that people. One of his prophecies was, that the laſt and general judgmement ſhould be on the 15th day of the enſuing November. The falſehood of this prediction was ſoon perceived, and of courſe his impoſture ought to have been detected; but ſuch is the power of enthuſiaſm over the human mind, that his fame roſe daily; and upon his going to London in 1655, he excited to no common pitch the envy of his brethren. He had ſtrange fancies of celeſtial illuminations, and conſidered himſelf as a great favourite of heaven. In 1656 he went into the weſt of England, but his extravagancies were ſo great and his opinions ſo blaſphemous, that even in thoſe days of fanatical deluſion, they were heard with ſuch horror, that the author of them was impriſoned in Exeter gaol, from which however he was relieved in the ſpace of a month. Upon this he determined to return to London; but taking Briſtol in his way, he made his entrance into that city in imitation of our Saviour's entrance into Jeruſalem, the people ſtrewing the way, &c. and calling out "Holy, holy, holy, Lord God of Sabaoth; hoſanna in the higheſt, &c." So impious a conduct

Nayres. Nazareth

could not eſcape animadverſion he was apprehended with ſix of his aſſociates. On examination he defended all that had paſſed; and was ſoon after with his followers ſent to London, impriſoned, and condemned to be whipt, and then put to hard labour. The ſentence, though much petitioned againſt, was executed, and he recovered his ſenſes, expreſſed his repentance, and was again received by the Quakers, who during his impious frenzy, had diſowned him. In 1659 he was freed from priſon; and the following year ſet off to ſee his wife and children; but being robbed and left bound by the way, he was found in that ſtate and carried to a friend's houſe at Rippon, where he died in November 1660. He was accounted the author of ſeveral works. His eccentricities, however, rather than his writings, have preſerved his character; and he ſtands forward to the world, not ſo much as a man of genius or parts, though he was in ſome meaſure poſſeſſed of both, but rather as a ſtriking example of the power of enthuſiaſm over the human mind, and of the danger of giving way to the religious reveries of an overheated imagination.

NAYRES, the nobility of the Malabar coaſt. We may with truth affirm that they are the oldeſt nobility in the world; for the moſt ancient writers mention them, and quote the law that permits the Nayre ladies to have many huſbands; every one being allowed four. Their houſes which ſtand ſingle, have as many doors as the lady has huſbands. When one of them viſits her, he walks round the houſe, ſtriking with his ſabre on his buckler: he then opens his door, and leaves a domeſtic with his arms in a kind of porch, who ſerves to inform others that the lady is engaged. It is ſaid, that one day in the week the four doors are all opened, and all her huſbands viſit her, and dine together with her. Each huſband gives a ſum of money, or portion, at the time of marriage; and the wife only has the charge of the children. The Nayres, even the Samorin, and the other princes, have no other heirs than the children of their ſiſters. This law was eſtabliſhed, that the Nayres, having no family, might be always ready to march againſt the enemy. When the nephews are of age to bear arms, they follow their uncles. The name of *father* is unknown to a Nayre child. He ſpeaks of the huſbands of his mother and of his uncles, but never of his father.

NAZARETH, a little city in the tribe of Zebulun, in Lower Galilee, to the weſt of Tabor, and to the eaſt of Ptolemais. Euſebius ſays, it is fifteen miles from Legion towards the eaſt. This city is much celebrated in the ſcriptures for having been the uſual place of the reſidence of Jeſus Chriſt for the firſt 33 years of his life. Luke ii. 51. It was there our Saviour became incarnate, where he lived in obedience to Joſeph and Mary, and from whence he took the name of a Nazarean. After he had begun to execute his miſſion, he preached there ſometimes in the ſynagogue, *id.* iv. 16. But becauſe his countrymen had no faith in him, and were offended at the meanneſs of his original, he did not many miracles there, Math. xiii. 54. 58. nor would he dwell therein: ſo he fixed his habitation at Capernaum for the latter part of his life, *id.* iv. 13. The city of Nazareth was ſituated upon an eminence; and on one ſide there was a precipice from whence the Nazareans one day had a deſign of throwing down our Saviour, becauſe he upbraided them with their incredulity, Luke iv. 29.

Nazareth.

St Epiphanius ſays, that in his time Nazareth was only a village, and that to the reign of Conſtantine it was inhabited by Jews alone, excluſive of all Chriſtians. Adamnanus, a writer of the ſeventh age, ſays, that in his time there were two great churches to be ſeen at Nazareth, one in the midſt of the city, built upon two arches, in the place where our Saviour's houſe had ſtood. Under the two arches now mentioned, was a very fine fountain, which furniſhed water to the whole city, and from whence water was drawn alſo by the help of a pulley for the uſe of the church above. The ſecond church of Nazareth was built in a place where the houſe ſtood wherein the angel Gabriel revealed to the virgin Mary the myſtery of our Lord's incarnation; and we are aſſured that the church of incarnation, which is ſupported by two arches, is ſtill in being to this day. Mr Maundrell tells us, that there is a convent built over what is ſaid to be the place of annunciation; for the chamber where ſhe received the angel's ſalutation was about 500 years ago removed from Nazareth, and, according to the Roman legends, tranſported by angels to Lorretto, then a ſmall village in the pope's dominions, now become a biſhop's ſee.—However, Calmet's opinion (which is certainly the true one) upon the different tranſlations of this famous houſe of Loretto is, that they were no other than ſo many different buildings made upon the model of the church of Nazareth, juſt as in ſeveral places ſepulchres have been built upon the model of that at Jeruſalem. Mariti tells us, that in the eaſtern part of the city ſtands the church dedicated to the Bleſſed Virgin: the zeal of the Cœnobites raiſed it from the ruins of that which had been deſtroyed by the Saracens. It is a very handſome building, and conſiſts of three naves; in the middle of which is the principal altar, to which there is an aſcent by two magnificent ſtairs, much admired for their iron balluſtrades, the work of an ingenious monk of the convent. The deſcent to the grotto or annunciation chapel below is by ſteps of beautiful marble, cut with great taſte. Two beautiful columns of oriental granite ſtrike the eye of the obſerver in the entrance. They appear to have been conſtructed both to ſupport and ornament the grotto. The altar of this ſubterranean chapel is extremely elegant; and the different kinds of marble with which it is ornamented, receive an additional luſtre from the combined light of ſeveral ſilver lamps preſented by Chriſtian princes. On ſolemn feſtivals, the walls and the pilaſters are ornamented with various pieces of tapeſtry, repreſenting the myſteries of the Virgin; a ſuperb preſent from the Houſe of Auſtria. In the weſtern part of the city ſtands a Chriſtian church, built, as is ſaid, on the ſite of the ancient ſynagogue where Jeſus ſhowed the Jews the accompliſhment of the prophecies in his perſon. This place ſerved a long time as a ſhelter for flocks, but at preſent it is in good repair. In the neighbourhood may be ſeen a fountain of excellent water, which is, however eſteemed by the people on another account. They conjecture that it was contiguous to the habitation of the Virgin, and that it was uſed by her. At ſome diſtance is a large ſtone of a round form, called *Chriſt's Table*. It is

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pretended that he came hither more than once with his diſciples to eat. The inhabitants of Nazareth pay it a kind of worſhip, by burning perfumes and incenſe around it. It is ſituated in 35° E. Long. and in 32° N. Lat.; and formerly held the third rank under the patriarchs of Jeruſalem. At preſent it is part of the domains of the chief of Acre. The ancient city, after the ravages of fanaticiſm, was reduced to a miſerable hamlet, containing only a few Arab huts. Under the protection of Daher Omar, however, it recovered very conſiderably, and is now of far more importance.

NAZARITE, or Nazarean, or *Nazaræus*, a term which may ſignify, 1. One that is of Nazareth, or any native of this city. 2. It was given to Jeſus Chriſt and his diſciples, and is commonly taken in a ſenſe of deriſion and contempt, in ſuch authors as have written againſt Chriſtianity. 3 It has been taken for a ſect of heretics called Nazareans. 4. For a Nazarite, a man that has laid himſelf under the obligation of a vow to obſerve the rules of Nazariteſhip, whether it be for his whole life, as Samſon and John the Baptiſt, or only for a time, as thoſe mentioned in Numbers vi. 18, 19, 20. Amos ii. 11, 12. Laſtly, the name Nazarite in ſome paſſages of ſcripture denotes a man of particular diſtinction and great dignity in the court of ſome prince. But we muſt ſpeak of theſe ſeveral ſorts of Nazarites ſomething more diſtinctly.

The name of Nazarene belongs to Jeſus Chriſt, not only becauſe of his having lived the greateſt part of his life at Nazareth, and becauſe this city has always been conſidered as his country, but alſo becauſe the prophets had foretold that he ſhould be called a Nazarene, Matth. ii. 23. "And he came and dwelt in a "city called Nazareth, that it might be fulfilled which "was ſpoken by the prophets, He ſhall be called a "Nazarene." We find no particular place in the prophets in which it is ſaid that the Meſſiah ſhould be called a Nazarene; and St Matthew only quotes the prophets in general. Perhaps he would inſinuate, that the conſecration of the Nazarites, and the great purity of which they made profeſſion, was a type and a ſort of prophecy of the life of our Saviour, or elſe that the name נזר *Nazir* or *Nazarite* given to the patriarch Joſeph, Gen. xlix. 26. Deut. xxxiii. 16. was a prophecy which was to be fulfilled in the perſon of Jeſus Chriſt, of whom Joſeph was a figure. Laſtly, St Jerom was of opinion, that St Matthew here alludes to that paſſage of Iſaiah xi. 1. and lx. 21. "And "there ſhall come forth a rod out of the ſtem of Jeſſe "and a branch (in Hebrew *Nezer*) ſhall grow out of "his roots." This branch or *Nezer*, and this rod, are certainly intended to denote Jeſus Chriſt, by the general conſent of all the fathers and interpreters.

When the word Nazarean is put for the heretics known by this name, it denotes Chriſtians converted from Judaiſm, whoſe chief error conſiſted in defending the neceſſity or expediency of the works of the law, and who obſtinately adhered to the practice of the Jewiſh ceremonies. The name of Nazarenes at firſt had nothing odious in it, and it was often given to the firſt Chriſtians. The fathers frequently mention the goſpel of the Nazarenes, which differs nothing from that of St Matthew, which was either in

Nazarite.

Hebrew or Syriac, for the uſe of the firſt converts, but was afterwards corrupted by the Ebionites. Theſe Nazareans preſerved this firſt goſpel in its primitive purity. Some of them were ſtill in being in the time of St Jerom, who does not reproach them with any error. They were very zealous obſervers of the law of Moſes, but had the traditions of the Phariſees in very great contempt.

Nazarite, when put to ſignify thoſe under the ancient law who made a vow of obſerving a more than ordinary degree of purity (Numb. *ubi ſup.*), denotes a man or woman who engage themſelves by a vow to abſtain from wine and all intoxicating liquors, to let their hair grow without cutting or ſhaving, not to enter into any houſe that was polluted by having a dead corpſe in it, nor to be preſent at any funeral. And if by chance any one ſhould have died in their preſence, they began again the whole ceremony of their conſecration and Nazariteſhip. This ceremony generally laſted eight days, ſometimes a month, and ſometimes their whole lives. When the time of their Nazariteſhip was accompliſhed, the prieſt brought the perſon to the door of the temple, who there offered to the Lord a he-lamb for a burnt-offering, a ſhe-lamb for an expiatory ſacrifice, and a ram for a peace-offering. They offered likewiſe loaves and cakes, with wine neceſſary for the libations. After all this was ſacrificed and offered to the Lord, the prieſt or ſome other ſhaved the head of the Nazarite at the door of the tabernacle, and burnt his hair, throwing it upon the fire of the altar. Then the prieſt put into the hand of the Nazarite the ſhoulder of the ram roaſted, with a loaf and a cake, which the Nazarite returning into the hands of the prieſt, he offered them to the Lord, lifting them up in the preſence of the Nazarite. And from this time he might again drink wine, his Nazariteſhip being now accompliſhed.

As to thoſe that were perpetual Nazarites, as were Samſon and John the Baptiſt, it appears that they were conſecrated to their Nazariteſhip by their parents, and continued all their lives in this ſtate without drinking wine or cutting their hair.

Thoſe that made a vow of Nazariteſhip out of Paleſtine, and could not come to the temple when their vow was expired, contented themſelves with obſerving the abſtinence required by the law, and after that cutting their hair in the place where they were: as to the offerings and ſacrifices preſcribed by Moſes, which were to be offered at the temple by themſelves or by others for them, they deferred this till they could have a convenient opportunity. Hence it was, that St Paul being at Corinth, and having made the vow of a Nazarite, he had his hair cut off at Cenchrea, and put off fulfilling the reſt of his vow till he ſhould arrive at Jeruſalem, Acts xviii. 18. When a perſon found that he was not in a condition to make a vow of Nazariteſhip, or had not leiſure to perform the ceremonies belonging to it, he contented himſelf by contributing to the expence of the ſacrifices and offerings of thoſe that had made and fulfilled this vow; and by this means he became a partaker in the merit of ſuch Nazariteſhip. When St Paul came to Jeruſalem, in the year of Chriſt 58, the apoſtle St James the Leſs, with the other brethren, ſaid to him, Acts xxi. 23, 24. that to quiet the minds of the converted Jews, who had ing informed that he every where preached up the entire abolition of the law of Moſes, he ought to join himſelf to four of the faithful who had a vow of Nazariteſhip upon them, and contribute to the charge of the ceremony at the ſhaving of their heads; by which the new converts would perceive that he continued to keep the law, and that what they had heard of him was not true.

The Hebrew word *Nazir*, or Nazarite, which is made uſe of to expreſs a man exalted to great dignity, as it is ſaid of the patriarch Joſeph, Gen. xlix. 26. and Deut. xxxiii. 16 "that he was ſeparate from his brethren," as it is in our tranſlation; or as the vulgate and others underſtand the Hebrew, "that he was "as a Nazarite among his brethren," is variouſly underſtood. Some think that the Hebrew word נזיר *Nazir*, in theſe places, ſignifies one who is crowned, choſen, ſeparated, or diſtinguiſhed: the word נזר *Nazir* ſignifies a crown. The Septuagint tranſlate this word a chief, or him that is honoured. Calmet thinks that this was a term of dignity in the courts of eaſtern princes; and that at this day in the court of Perſia the word *Nazir* ſignifies the ſuperintendant general of the king's houſehold, the chief officer of the crown, the high ſteward of his family, treaſures, and revenues; and that in this ſenſe Joſeph was the Nazir of the court of Pharaoh. Le Clerc tranſlates the *Nazir*, a prince and calls Joſeph "the prince of his brethren," in the two places already quoted, Mr Pool declares in favour of this laſt tranſlation. See *Joſeph. Chardin. Croyſſ.* [illegible] &c.

NAZIANZEN. See Gregory *Nazianzen.*

NAZIM, the lord lieutenant, viceroy, or governor of a province in Hindoſtan; the ſame as *Subahdar*, or *Nabob*.

NEALED, among ſeamen, is uſed when the ſounding is deep water cloſe to the ſhore; as alſo when the ſhore is ſandy, clayey, oozy, or foul and rocky ground.

NEALING, or rather Annealing, a term uſed for the preparing of ſeveral matters, by heating or baking them in the oven, or the like.

Nealing of glaſs, is the baking of glaſs, to dry, harden, and give it the due conſiſtence, after it has been blown, and faſhioned into the proper works.— This is uſually performed in a kind of tower called the *leer*, built over the melting furnace. See Glass.

Nealing of glaſs is alſo uſed for the art of ſtaining glaſs with metalline colours. "One fine uſe of ſilver (ſays Mr Boyle) was only diſcovered ſince the art of annealing upon glaſs came to be practiſed. For prepared ſilver, or even the crude metal, being burnt on a glaſs plate, will tinge it of a fine yellow or golden colour. And there are ſeveral mineral earths, and other coarſe matters uſed in this art, which by means of fire impart tranſparent colours to glaſs, and ſometimes very different ones from thoſe of the bodies themſelves.

Nealing of ſteel, is the heating it in the fire to a blood-red heat, and then taking it out, and letting it cool gently of itſelf. This is done to make it ſofter, in order to engrave or punch upon it. See Tempering and Engraving.

Nealing is alſo uſed for the art or act of burning or baking earthen or other ware in an oven. The miners at Mendip, when they meet with a rock they cannot cut through, anneal it by laying on wood and coal, and contriving the fire ſo that they quit the mine before the operation begins, it being dangerous to enter it again before it be quite cleared of the ſmoke.

Nealing of tile is uſed in ancient ſtatutes for the burning of tile. The word is formed of the Saxon *onælan, accendere*, to light, burn.

NEAP, or Neep-tides, are thoſe tides which happen when the moon is in the middle of the ſecond and fourth quarters. The neap tides are low tides, in reſpect of their oppoſites the ſpring-tides. As the higheſt of the ſpring-tides is three days after the full or change, ſo the loweſt of the neap is four days before the full or change. On which occaſion the ſeamen ſay that it is deep neap.

NEAPED. When a ſhip wants water, ſo that ſhe cannot get out of the harbour, off the ground, or out of the dock, the ſeamen ſay ſhe is *neaped*, or *beneaped*.

NEAPOLIS (anc. geog.), a city of the Higher Egypt, in the Nomos Panopolitanus, between Thebæ to the ſouth, and Panopolis to the north, on the eaſt ſide of the Nile; otherwiſe called *Cæne*.—A ſecond Neapolis of Babylonia, ſituated near the Euphrates on the ſouth ſide.—A third of Campania, an ancient town and a colony of the Cumani. (See Velleius, Pliny, Strabo); accounted a Greek city, and a great ſtickler for Greek uſages, (ſee Livy, Tacitus). Its hot baths were in nothing inferior to thoſe of Baiæ, according to Strabo: at two miles diſtance from it ſtands the monument of Virgil, held in religious veneration by learned poſterity. The Younger Pliny relates, that Virgil's birth-day was more religiouſly obſerved by Silius Italicus than his own, eſpecially at Naples, where he reſorted to his tomb as to a temple. The city is waſhed by the river Sebethos. Virgil feigns the nymph Sebethis to preſide over the ſtream. Now *Naples*, capital of the kingdom of that name. See Naples.—A fourth, Neapolis of Caria, near the Meander. (Ptolemy).—A fifth, an inland town of Cyrenaica, ſituated between Ptolemais and Arſinoe, (Ptolemy); and to be diſtinguiſhed from the Cænopolis, or Neapolis, on the eaſt border of the ſame province, (id). A ſixth of Ionia, (Strabo); which belonged firſt to the Epheſians, but afterwards to the Samians, who exchanged Maratheſium, a more diſtant city, for a nearer.—A ſeventh, Neapolis of Macedonia Adjecta, ſituated at the diſtance of 12 miles to the eaſt of Philippi, (Antonine).—An eighth, Neapolis of Piſidia, on the borders of Galatia, ſituated between Amblada and Pappa, (Ptolemy).—A ninth, of Samaria, the ancient *Sichem*, which ſee; ſo called upon its reſtoration by the Romans, (Coins, Pliny, Joſephus).—A tenth, of Sardinia, ſituated on the ſouth-weſt ſide of the iſland, 30 miles to the north of Metalla: now called *Neapoli*.—An eleventh, of the Regio Syrtica, called alſo *Leptis*.—A twelfth, of Zeugitana, on the Mediterranean, to the eaſt of Clypea, and ſouth of the Promontorium Mercurii.

NEAT, or *Net Weight*, the weight of a commodity alone, clear of the caſk, bag, caſe, or even filth. See Net.

NEBIO, or Nebbio, a ruined town of Italy on the north ſide of the iſland of Corſica, with a biſhop's ſee, whoſe biſhop reſides at San Florenzo, from which it is a mile diſtant.

NEBO, (anc. geog.), a very high mountain, a part of the mountains Abarim, and their higheſt top, whither Moſes was ordered to aſcend to take a view of the land of Canaan, and there die. Situated in the land of Moab, over-againſt Jerico; with a cognominal town at its foot (Iſaiah) belonging to the Reubenites, which afterwards returned to the Moabites; in Jerome's time deſolate: eight miles to the ſouth of Heſhbon.

NEBO, or *Nabo*. See NABO.

NEBUCHADNEZZAR. See NABUCHADNEZZAR.

NEBULY, or NEBULEE, in heraldry, is when a coat is charged with ſeveral little figures, in form of words running within one another, or when the outline of a bordure, ordinary, &c. is indented or waved.

NECESSITY, whatever is done by a cauſe or power that is irreſiſtible; in which ſenſe it is oppoſed to freedom. Man is a neceſſary agent, if all his action be ſo determined by the cauſes preceeding each action, that not one paſt action could poſſibly not have come to paſs, or have been otherwiſe than it hath been; nor one future action can poſſibly not come to paſs, or be otherwiſe than it ſhall be. But he is a free agent, if he be able, at any time, under the circumſtances and cauſes he then is, to do different things; or in other words, if he be not unavoidably determined in every point of time, by the circumſtances he is in, and the cauſes he is under, to do that one thing he does, and not poſſibly to do any other thing. Whether a man is a neceſſary or a free agent, is a queſtion which has been debated with much ingenuity by writers of the firſt eminence, from Hobbes and Clarke, to Prieſtley and Gregory. See METAPHYSICS, Part III. chap. 5. and PREDESTINATION.

NECESSITY, in mythology, a power ſuperior to all other powers, and equally irreſiſtible by gods and by men. Herodotus, as he is quoted by Cudworth, mentions an oracle which declared that "God himſelf could not ſhun his deſtined fate." And among the fragments of Philemon collected by Le Clerc, is the following ſentence:

Δουλοι βασιλεων, εσμεν οἱ βασιλεις θεων, ὁ θεος αναγκης.

"We are ſubject to kings, kings to the gods, and God to neceſſity." Hence it is, that in the Iliad, we find Jove himſelf the ſire of gods and men, regretting that he was reſtrained by *neceſſity* from reſcuing his favourite ſon from the ſword of Patroclus. Nay to ſuch a height was this impiety carried in the earlieſt ages of Greece, that we find heſiod and Homer teaching that the gods themſelves were generated by *neceſſity*, of night and chaos.

This power though always repreſented as blind and unintelligent, was however worſhipped as a goddeſs, bearing in her hand large iron-nails, wedges, anchors and melted lead*, as emblems of the inflexible ſeverity of her nature. "In the city of Corinth ſhe had a temple, in which the goddeſs *Violence* likewiſe reſided, and into which no perſon was ever permitted to enter but the prieſt who officiated *in ſacris* †."

Learned men have exerciſed their ingenuity in vain attempts to trace this portentous notion to its origin. Some, who wiſhed to interpret it in a pious ſenſe, have ſuppoſed that the gods who were ſubject to *neceſſity* were only thoſe who were the miniſters of the ſupreme *numen*; and that by *neceſſity* itſelf was means nothing more than divine providence. But this is not conſiſtent with Heſiod and Homer's generation of the gods, or with the epithets *ſæva neceſſitas, dura neceſſitas*, by which this power was perpetually diſtinguiſhed. Others, and among them Moſheim, have ſuppoſed that this monſtrous fable was invented by the pagan prieſts, and diligently inculcated upon the minds of the people in order to excuſe the villainies of the objects of their worſhip. For, ſays he, who could be indignant at Jupiter's numberleſs adulteries, after it was known that in all his actions he was the ſervant of blind neceſſity! In the thefts of *Mercury*, the whoredoms of *Venus* and the frequent ſquabbles of the other gods, there could be no moral turpitude, if they were under the influence of a ſuperior power.

Numina cum videas duris obnoxia fatis,
Invidia poſſis exonerare deos‡.

This account of the matter is at leaſt as plauſible as any other which is uſually given; but the real caſe undoubtedly was, that when men "did not like to retain God in their knowledge, God gave them over to a reprobate mind to do thoſe things which are not convenient; when their fooliſh heart was darkened, and profeſſing themſelves to be wiſe, they became fools." See PARCÆ.

NECESSITY, in law, as it implies a defect of will, excuſes from the guilt of crimes. See CRIME.

Compulſion and inevitable *neceſſity* are a conſtraint upon the will, whereby a man is urged to do that which his jugment diſapproves; and which, it is to be preſumed, his will (if left to itſelf) would reject. As puniſhments are therefore only inflicted for the abuſe of that free-will which God has given to man, it is highly juſt and equitable that a man ſhould be excuſed for thoſe acts which are done through unavoidable force and compulſion.

1. Of this nature, in the firſt place, is the obligation of *civil ſubjection*, whereby the inferior is conſtrained by the ſuperior to act contrary to what his own reaſon and inclination would ſuggeſt: as when a legiſlator eſtabliſhes iniquity by a law, and commands the ſubject to do an act contrary to religion or ſound morality. How far this excuſe will be admitted *in foro conſcientiæ* or whether the inferior in this caſe is not bound to obey the divine rather than the human law, it is not our buſineſs to decide; though, among the caſuiſts, it is believed the queſtion will hardly bear a doubt. But, however that may be, obedience to the laws in being is undoubtedly a ſufficient extenuation of civil guilt before the municipal tribunal. The ſheriff who burnt Latimer and Ridley, in the bigotted days of Queen Mary, was not liable to puniſhment from Eliſabeth for executing ſo horrid an office; being juſtified by the commands of that magiſtracy which endeavoured to reſtore Superſtition. under the holy auſpices of its mercileſs ſiſter, Perſecution.

As to perſons in private relations, the principal caſe where conſtraint of a ſuperior is allowed as an excuſe for criminal miſconduct, is with regard to the matrimonial ſubjection of the wife to her huſband:

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* Horace, Lib i. Ode 35.

† Pauſanias in Corinth, Cap. 4.

‡ Martial. Epigram Lib ix N. 88. Ed. Amſtel. 1701.

Neceſſity.

Neceſſity.

for neither a ſon nor ſervant are excuſed for the commiſſion of any crime, whether capital or otherwiſe, by the command or coercion of the parent or maſter: though in ſome caſes the command or authority of the huſband, either expreſs or implied, will privilege the wife from puniſhment, even for capital offences. And therefore, if a woman commit theft, burglary, or other civil offences againſt the laws of ſociety, by the coercion of her huſband, or even in his company, which the law conſtrues a coercion, ſhe is not guilty of any crime; being conſidered as acting by compulſion, and not of her own will. Which doctrine is at leaſt 1000 years old in this kingdom, being to be found among the laws of King Ina the Weſt-Saxon. And it appears, that, among the northern nations on the continent this privilege extended to any woman tranſgreſſing in concert with a man, and to any ſervant that committed a joint offence with a freeman: the male or freeman only was puniſhed, the female or ſlave diſmiſſed; *procul dubio quod alterum libertas, alterum neceſſitas impelleret*. But (beſides that in our law, which is a ſtranger to ſlavery, no impunity is given to ſervants, who are as much free agents as their maſters) even with regard to wives, this rule admits of an exception in crimes that are *mala in ſe*, and prohibited by the law of nature; as murder, and the like: not only becauſe theſe are of a deeper dye, but alſo, ſince in a ſtate of nature no one is in ſubjection to another, it would be unreaſonable to ſcreen an offender from the puniſhment due to natural crimes, by the refinements and ſubordinations of civil ſociety. In treaſon alſo (the higheſt crime which a member of ſociety can, as ſuch, be guilty of), no plea in coverture ſhall excuſe the wife: no preſumption of the huſband's coercion ſhall extenuate her guilt: as well becauſe of the odiouſneſs and dangerous conſequence of the crime itſelf, as becauſe the huſband, having broken through the moſt ſacred tie of ſocial community by rebellion againſt the ſtate, has no right to that obedience from a wife, which he himſelf as a ſubject has forgotten to pay. In inferior miſdemeanors alſo, we may remark another exception, that a wife may be indicted and ſet in the pillory with her huſband, for keeping a brethel: for this is an offence touching the domeſtic œconomy or government of the houſe, in which the wife has a principal ſhare; and is alſo ſuch an offence as the law preſumes to be generally conducted by the intrigues of the female ſex. And in all caſes where the wife offends alone, without the company or coercion of her huſband, ſhe is reſponſible for her offence as much as any feme-ſole.

2. Another ſpecies of compulſion or neceſſity is what our law calls *dureſs per minas*; or threats and menaces, which induce a fear of death or other bodily harm, and which take away for that reaſon the guilt of many crimes and miſdemeanors, at leaſt before the human tribunal. But then that fear which compels a man to do an unwarrantable action ought to be juſt and well grounded; ſuch, "*qui cadere poſſit in virum conſtantem, non timidum et meticuloſum*," as Bracton expreſſes it, in the words of the civil law. Therefore, in time of war or rebellion, a man may be juſtified in doing many treaſonable acts by compulſion of the enemy or rebels, which would admit of no excuſe in the time of peace. This, however, ſeems only, or at leaſt principally, to hold as to poſitive crimes, ſo created by the laws of ſociety, and which therefore ſociety may excuſe; but not as to natural offences, ſo declared by the law of God, wherein human magiſtrates are only the executioners of divine puniſhment. And therefore though a man be violently aſſaulted, and hath no other poſſible means of eſcaping death but by killing an innocent perſon, this fear and force ſhall not acquit him of murder: for he ought rather to die himſelf than eſcape by the murder of an innocent. But in ſuch a caſe he is permitted to kill the aſſailant: for there the law of nature, and ſelf-defence its primary canon, have made him his own protector.

3. There is a third ſpecies of neceſſity, which may be diſtinguiſhed from the actual compulſion of external force or fear: being the reſult of reaſon and reflection, which act upon and conſtrain a man's will, and oblige him to do an action which without ſuch obligation would be criminal. And that is, when a man has his choice of two evils ſet before him, and, being under a neceſſity of chooſing one, he chooſes the leaſt pernicious of the two. Here the will cannot be ſaid freely to exert itſelf, being rather paſſive than active; or, if active, it is rather in rejecting the greater evil than in chooſing the leſs. Of this ſort is that neceſſity, where a man by the commandment of the law is bound to arreſt another for any capital offence, or to diſperſe a riot, and reſiſtance is made to his authority: it is here juſtifiable, and even neceſſary, to beat, to wound or perhaps to kill, the offenders, rather than permit the murderer to eſcape, or the riot to continue. For the preſervation of the peace of the kingdom, and the apprehending of notorious malefactors, are of the utmoſt conſequence to the public; and therefore excuſe the felony, which the killing would otherwiſe amount to.

4. There is yet another caſe of neceſſity, which has occaſioned great ſpeculation among the writers upon general law; viz. whether a man in extreme want of food or clothing may juſtify ſtealing either, to relieve his preſent neceſſities. And this both Grotius and Puffendorf, together with many other of the foreign juriſts, hold in the affirmative; maintaining by many ingenious, humane, and plauſible reaſons, that in ſuch caſes the community of goods, by a kind of tacit conceſſion of ſociety, is revived. And ſome even of our lawyers have held the ſame; though it ſeems to to be an unwarranted doctrine, borrowed from the notions of ſome civilians: at leaſt it is now antiquated, the law of England admitting no ſuch excuſe at preſent. And this its doctrine is agreeable not only to the ſentiments of many of the wiſeſt ancients, particularly Cicero who holds, That *ſuum cuique incommodum ferendum eſt, potius quam de alterius commodis detrahendum*; but alſo to the Jewiſh law, as certified by King Solomon himſelf: "If a thief ſteal to ſatisfy his ſoul when he is hungry, he ſhall reſtore ſevenfold, and ſhall give all the ſubſtance of his houſe:" which was the ordinary puniſhment for theft in that kingdom. And this is founded upon the higheſt reaſon; for mens properties would be under a ſtrange inſecurity, if liable to be invaded according to the wants of others: of which wants no man can poſſibly be an adequate judge, but the party himſelf who pleads them. In England

eſpecially, there would be a peculiar impropriety in admitting ſo dubious an excuſe: for by the laws ſuch ſufficient proviſion is made for the poor by the power of the civil magiſtrate, that it is impoſſible that the moſt needy ſtranger ſhould ever be reduced to the neceſſity of thieving to ſupport nature. The caſe of a ſtranger is, by the way, the ſtrongeſt inſtance put to Baron Puffendorf, and whereon he builds his principal arguments: which, however they may hold upon the continent, where the parſimonious induſtry of the natives orders every one to work or ſtarve, yet muſt loſe all their weight and efficacy in England, where charity is reduced to a ſyſtem, and interwoven in the very conſtitution. Therefore the laws ought by no means to be taxed with being unmerciful, for denying this privilege to the neceſſitous; eſpecially when we conſider, that the king, on the repreſentation of his miniſters of juſtice, hath a power to ſoften the law, and to extend mercy in caſes of peculiar hardſhip. An advantage which is wanting in many ſtates, particularly thoſe which are democratical: and theſe have in its ſtead introduced and adopted, in the body of the law itſelf, a multitude of circumſtances tending to alleviate its rigour. But the founders of that conſtitution thought it better to veſt in the crown the power of pardoning particular objects of compaſſion, than to countenance and eſtabliſh theft by one general undiſtinguiſhing law.

NECHO, king of Egypt, began his reign 690 B. C. and was killed eight years after by Sabacon king of Ethiopia. Pſammiticus his ſon ſucceeded him, and ~~was~~ the father, as Herodotus informs us, of Necho II. who reigned in the 616 B. C. This Necho II. is celebrated in hiſtory for attempting, though in vain, to cut a canal from the Nile to the Arabian gulf. He carried his arms as far as the Euphrates, and conquered the city of Carchemiſh. This prince is not only known in ſcripture under the name of *Necho*, but alſo in profane hiſtory. He no ſooner ſucceeded to the crown than he raiſed great land armies, and fitted out vaſt fleets, as well upon the Mediterranean as upon the Red Sea: he gave battle to the Syrians near the city of Migdol; routed them, and made himſelf maſter of the city of Cadytis. The learned, however, are not agreed about this city Cadytis. Some will have it to be Cades in Arabia Petræa, others Jeruſalem; and others ſay it is the city of Cedes, or Kedeſh, in Galilee, in the tribe of Naphtali.

The ſcriptures acquaint us with the whole expedition of Necho in all its particulars, 2 Kings xxiii. 29. &c. and 2 Chr. xxxv. 20. 21, &c. In the year of the world 3394, this prince having drawn out his army into the field to make war with the Aſſyrians or Babylonians, and to take the city of Carchemiſh, otherwiſe called *Circuſium*, upon the Euphrates, Joſiah king of Judah, who was a tributary to the king of Babylon, marched to oppoſe his paſſage. Necho, who had no deſigns againſt him, ſent to tell him, What have I to do with you, King of Judah? It is not againſt you that I am come forth, but againſt another people, againſt whom the Lord has commanded me to make war. Leave off therefore to ſet yourſelf againſt me, for fear the Lord ſhould puniſh you for your reſiſtance. But Joſiah would not hearken to the remonſtrances of Necho, but gave him battle at Megiddo, where he received the wound of which he died. The people of Jeruſalem ſet up Jehoahaz for king of Judah, and Necho ſoon paſſed forwards, without making any longer ſtay in Judea.

But at his return from his expedition, which was very ſucceſsful, he halted at Riblah in Syria; and ſending for Jehoahaz king of the Jews, he depoſed him, loaded him with chains, and ſent him into Egypt. Then coming to Jeruſalem, he [illegible] up Eliakim, or Jehoiakim, in his place, and exacted the payment of 100 talents of ſilver and one talent of gold from the country. Jeremiah (xlvi. 2.) acquaints us, that the city of Carchemiſh was taken from Necho by Nebuchadnezzar king of Babylon, in the fourth year of Jehoiakim king of Judah: ſo that Necho did not enjoy his conqueſt above four years. Joſephus adds, that the king of Babylon purſuing his victory, brought under his dominion all the country which is between the Euphrates and Egypt, excepting Judea. Thus Necho was again reduced within the limits of his own country.

NECK, in anatomy, is the ſlender part ſituated between the head and trunk of the body. See ANATOMY, nº 31.

NECOPHORON, in botany, a name uſed by Pliny and other authors for the *ſmilax aſpera*, or *rough bindweed*.

NECROLIUM, a word uſed by ſome of the alchemical writers to expreſs a remedy almoſt always capable of averting death, and continuing life to its utmoſt period.

NECROLOGY, *necrologium*, formed of νεκρος, "dead," and λογος, "diſcourſe or enumeration," a book anciently kept in churches and monaſteries, wherein were regiſtered the benefactors of the ſame, the time of their deaths, and the days of their commemoration; as alſo the deaths of the priors, abbots, religious, canons, &c. This was otherwiſe called *calendar* and *obituary*.

NECROMANCY, the art of revealing future events by a pretended communication with the dead.

This ſuperſtitious and impious impoſture appears to have had its origin at a very early period in Egypt, and to have been thence propagated in every nation with the manners of which hiſtory has made us acquainted. The conqueſts of Seſoſtris might introduce it into India; the Iſraelites would naturally borrow it from the people among whom they ſojourned 400 years; and it would eaſily find its way into Phœnicia, from the vicinity of that country to the land of its nativity. From the Egyptians and Phœnicians it was adopted, with the other rites of paganiſm, by the Greeks; and it was imported into Rome with Grecian literature and Grecian manners. It was not however confined to the pagan nations of antiquity; it ſpread itſelf through all the modern nations of Europe, and took ſuch deep root as to be long retained even after thoſe nations were converted to the Chriſtian faith.

Of its early antiquity we have complete evidence in the writings of Moſes, where it is ſeverely condemned as an abomination to the Lord*; and though it appears to have been even then ſpread into Phœnicia, we might yet conclude its birth-place to have been Egypt, becauſe, at their *exody*, the Iſraelites were

* Deut. xviii. 10, 11. 12.

corrupted only by Egyptian ſuperſtitions, and becauſe necromancy ſeems to be one of thoſe whoredoms which the prophet Ezekiel repreſents his countrymen as having brought with them from Egypt, and continued to practiſe till they were carried captives into Babylon.

If from ſacred we proceed to conſult profane authors, we ſhall find them not only affirming Egypt to have been the birth-place of necromancy, but in ſome degree accounting for the origin of ſo impious a deluſion. From Diodorus the Sicilian † we learn, that the Grecian fable of *Charon* the ferry-man of hell, of *Styx*, *Coccytus*, the *Elyſian Fields*, *Tartarus*, the judgement of *Minos*, and *Radamanthus*, &c. with the whole ſcenery of the infernal regions, were imported from Egypt into Greece. The ancient Egyptians, and indeed all the people of the eaſt, made uſe of caves for burying places, which were well ſuited to the ſolemn ſadneſs of the ſurviving friends, and proper receptacles for thoſe who were never more to behold the light. In Egypt, many of thoſe ſubterraneous cavities being dug out of the natural rock, ſtill remain and command the admiration of travellers; and near to the pyramids in particular there are ſome apartments of a wonderful fabric, which though they extend in length 4400 feet, and are about 30 feet in depth, appear to have been, if not entirely dug, at leaſt reduced to form by the chizzel or pick axe of the artiſt.

† Lib. 1. § 2.

From the practice of burying in ſuch caverns ſprung the opinion that the infernal manſions were ſituated ſomewhere near the centre of the earth, which by the Egyptians was believed to be not very diſtant from its ſurface ‡. In theſe dreary manſions, it was very eaſy for ſuch adepts as the prieſts of Egypt to fabricate Erebus, Tartarus, the Elyſian Fields, and all thoſe ſcenes which were diſplayed before the initiated (ſee Mysteries), and by them deſcribed to the million of the people. As it was in thoſe dark abodes that necromancy was practiſed, it would be no difficult matter for ſuch magicians as withſtood Moſes to impoſe ſo far upon the credulous vulgar, as to make them believe, that in conſequence of their avocations they actually ſaw the ghoſts of their friends aſcend out of the earth. It appears from the book of Exodus, that the Iſraelitiſh women were, even in the wilderneſs, well acquainted with the uſe of the mirror, which was therefore undoubtedly known to the Egyptians. But a mirror of a particular form and properly illuminated at the inſtant required, might eaſily be made to reflect, in a cavern from which all other light was carefully excluded, the image of the deceaſed, who was called upon by the necromancer; and we can readily conceive, that with reſpect to the queſtion to be propoſed, a perſon might be concealed, prepared to give ſuch ambiguous anſwers as would ſatisfy the inquirer, and at the ſame time ſave the credit of the oracle. The terrified imaginations of the ſpectators would aid the deluſion, and make a very ſlight reſemblance paſs for the ghoſt or ειδωλον of their departed friend; or the necromancer might aſſign plauſible reaſons why a ſpectre, after having dwelt for ſome time in the infernal regions, ſhould loſe ſomething of its reſemblance to the body which it animated. Such juggling tricks, though performed by artiſts leſs accompliſhed than Jannes and Jambres, have gained credit among people much more enlightened than the Egyptians can poſſibly have been when the ſcience of necromancy was invented by their prieſts.

‡ Bryant's Analyſis of Mythology.

That the Iſraelites, notwithſtanding the prohibition of their legiſlator, continued to practice the rites of necromancy, is apparent from Saul's tranſaction with the witch of Endor (ſee Magic). From the ſame tranſaction, it is likewiſe apparent that the witches of Iſrael, and therefore in all probability the necromancers of Egypt, pretended to evocate the ghoſts of the dead by a *dæmon* or *familiar ſpirit*, which they had at their command to employ upon every emergency. This dæmon was called ob; and therefore Saul deſires his ſervants to find him a woman who was miſtreſs of an ob (a). It is probable that thoſe wretched impoſtors had in their pay ſome perſons who occaſionally acted the part of the dæmon, and when the execution of the plot required their agency, emitted, by means of a cavity dug for that purpoſe, a low hollow voice from below the ground. Hence we find Iſaiah, in his denunciations againſt Ariel*, ſaying, "Thou ſhalt be brought down, and ſhall ſpeak out of the ground; and thy ſpeech ſhall be low out of the duſt, and thy voice ſhall be as one that hath a familiar ſpirit (an ob) out of the ground, and thy ſpeech ſhall whiſper out of the duſt."

* Chap, xxix. 4.

But though the Egyptian prieſts were undoubtedly the inventors of the whole myſtery of necromancy, and though it was from them imported into Greece by the Selli or prieſts of Dodona, it does not appear that the Grecian necromancers pretended to be maſters of obs or familiar ſpirits. Mopſus, Orpheus, Linus, Eumolpus, &c. who either travelled into Egypt in queſt of knowledge, or were actually natives of that country, inſtructed the early Greeks in this occult ſcience: but whatever might be the practice of theſe apoſtles themſelves, their diſciples profeſſed to do all the feats of magic by performing certain rites, by offering certain ſacrifices, by muttering a certain form of words, by charms, ſpells, and exorciſms. By theſe they pretended to evocate the dead as certainly as the Egyptians and Jews did by their *familiar ſpirits*. By a ſmall diſplay of critical learning this might be eaſily proved from the popular ſtory of Orpheus and Euridice, which certainly was founded on one of theſe necromantic deceptions exhibited in a cave near Dodona, where the prieſts had a *hades* or infernal manſion, in humble imitation of thoſe with which the firſt of them were well acquainted in Egypt. It is indeed evident, without the aid of criticiſm; no man of any letters is ignorant, that whatever ſuperſtitions of this kind prevailed among the Romans were borrowed from the Greeks. But we all know that Virgil makes one of his ſhepherds, by means of certain herbs, poiſons, and ſenſeleſs charms, raiſe up ghoſts from the bottoms of their graves; and Lucan has fabricated a ſtory of this kind which may be conſidered as an exact parallel to the which of Endor. Juſt before the battle of Pharſalia he makes† young Pompey travel by night to a Theſſalian ſorcereſs, and anxiouſly inquire of her the iſſue of the war. This female necromancer, by a tedious proceſs of charms and incantations, conjures up the ghoſt of a ſoldier who had been lately ſlain. The phantom, after a long preamble, denounces a prediction much of the ſame kind with that which the king of Iſrael received from Samuel at Endor; and though we have elſewhere ſhown, that nothing but the ſpirit of God could have foreſeen the inevitable deſtruction of Saul, his ſons, and his army (ſee MAGIC), it was very eaſy for any man of tolerable ſagacity to foreſee the defeat of Pompey's raw and undiſciplined troops by the hardy veterans of the victorious Cæſar.

(a) The original or radical, ſignification of this word occurs in Job xxxii. ver. 19; where Elihu compares his belly to new bottles, which he calls *oboth*, the plural of *ob*. But as bottles were then made of leather, new bottles filled with wine and ready to burſt, as Elihu deſcribes them, would of courſe be of a form nearly globular. Hence it may be inferred that the original import of *ob* was *round* or *globular:* but *b* and *p* being labials, are often changed into each other; and therefore from the Hebrew *ob* is derived the Greek ωψ *oculus* οπτομαι *video*, and the Latin *ops*, a name under which the earth was worſhipped. *Upis* was a name of Diana or the moon: the father of one of the Dianas was likewiſe *upis;* but this *upis* was undoubtedly the ſun. Now the difference between *upis* and *opis* is nothing; hence we are led to believe that as they are all derived from *ob*, this word was employed by the early idolaters of Egypt to denote the firſt and greateſt of Pagan gods, the ſun. If ſo, thoſe wretches who pretended to be miſtreſſes of *obs*, were exactly the ſame kind of impoſtors with the Pythoneſſes of the Greeks.

† Lib. vi. ver. 570. et ſeq.

It would be endleſs to enumerate all the fallacious evocations of ghoſts, and the ambiguous reſponſes returned by thoſe pretended ſpirits, of which we have accounts from the poets and hiſtorians of the celebrated nations of antiquity. We ſhall therefore proceed to mention a few which occur in the fabulous hiſtory of more modern nations, and then leave the ſubject to the meditation of our readers. In Mallet's northern antiquities, we have the following account of a necromantic exploit, between which and the deſcent of the ancient heroes into hell, it is impoſſible not to remark a ſtriking ſimilitude.

"Odin the ſovereign of man ariſes. He ſaddles his horſe Sleipner; he mounts, and is conveyed to the ſubterraneous abode of *Hela*. The dog which guards the gates of death meets him. His breaſt and his jaws are ſtained with blood. He opens his voracious mouth to bite, and barks a long time at the father of magic. Odin purſues his way; and the infernal cavern reſounds and trembles under his horſe's hoofs. At length he reaches the deep abode of death, and ſtops near the eaſtern gate, where ſtands the tomb of the propheteſs. He ſings with a voice adapted to call up the dead: he looks towards the world; he engraves Runic characters on her tomb; he utters myſterious words; and he demands an anſwer, until the propheteſs is conſtrained to ariſe and thus utter the words of the dead—"Who is this unknown that dares to diſturb my repoſe, and drag me from the grave, in which I have been dead ſo long, all covered with ſnow, and moiſtened with the rains?" &c.

The Gallic druids pretended to be maſters of the ſame ſecret. This is evident from the name of a ſpecies of divination, not uncommon among the Scotch Highlanders ſo lately as in the beginning of the preſent century. By a gentleman excellently verſed in the antiquities of that people, and a ſteady friend to the writer of this article, we have been informed, that not many years ago ſome of the Highlanders relied implicitly upon certain oracular reſponſes, called in their language *taghairm*. This word ſeems to be compounded of *ta*, which in ſome parts of the highlands is ſtill uſed to denote a ſpirit or ghoſt, and *ghairm*, which ſignifies *calling upon* or invoking. *Taghairm*, therefore, in its original import, is *necromancy* in the moſt proper ſenſe of that word.

There were different kinds of *taghairm*, of which one was very lately practiſed in *Sky*. The diviner covered himſelf with a cow's hide, and repaired at night to ſome deep ſounding cave, whither the perſon who conſulted him followed ſoon after without any attendants. At the mouth of the cave he propoſed aloud the queſtions of which he wanted ſolutions; and the man within pronounced the reſponſes in a tone of voice ſimilar to that with which the OBS, or pretended dæmons of antiquity, gave from beneath the ground their oracular anſwers. That in the latter days of *taghairm*, the Gallic diviners pretended to evocate ghoſts, and from them to extort ſolutions of difficulties propoſed, we have no poſitive evidence; but that ſuch was the original pretence, there can be little doubt, when we reflect either upon the place where this ſpecies of divination was practiſed, or upon the import of the word by which it was denominated.

As we have been led to mention *taghairm*, we ſhall beg leave to make a few obſervations on another ſpecies of it, called *taghairm an uiſge*, or "*taghairm* by water." This too was laſt practiſed in the Iſle of Sky, by a man of the name of *M'Cuidhean*, whoſe anceſtors had long been famous for the art. He lived near a beautiful caſcade on a ſmall river; and when conſulted on any matter of conſequence, he covered his whole body with a cow's hide, that neceſſary implement of Highland divination, and placed himſelf between the water of the caſcade and the rock over which it flowed. Then another man with a heavy pole gave repeated ſtrokes to the water, and the diviner behind it crying out now and then in Gaelic, "Is this a ſtock of arn?" This operation was continued till M'Cuidhean was perceived to be frantic or furious, when he was conſidered as in a condition to anſwer the moſt important queſtions. He was frequently conſulted about futurity; and though he could not in a proper ſenſe of the word, be called a *necromancer*, his reſponſes were liſtened to as proceeding from ſomething more than human. A degree of frenzy, either real or affected, ſeems to have accompanied the predictions of certain kinds of diviners in all ages; and we cannot help remarking the ſimilarity between the madneſs of M'Cuidhean and that of the Sybil in the ſixth book of the Æneid; though we cannot ſuppoſe the one to have been borrowed from the other.

> *At, Phœbi nondum patiens, immanis in antro*
> *Bacchatur vates, magnum ſi pectore poſſit*
> *Excuſſiſſe Deum: tanto magis ille fatigat*
> *Os rabidum, fera corda domans, fingitque premendo.*
>
> Struggling in vain, impatient of her load,
> And lab'ring underneath the pond'rous god;
> The more ſhe ſtrove to ſhake him from her breaſt,
> With more and far ſuperior force he preſs'd.
>
> *Dryden.*

That all theſe pretences, whether ancient or modern, to the power of divination by means of familiar ſpirits, or by the art of necromancy, were groundleſs as well as impious, it would be affronting the underſtandings of our readers to offer any proof. Under the article Magic we have ſaid enough on the ſubject, and perhaps more than enough, to thoſe who know that dæmons, if they have any exiſtence, and the departed ſpirits of good and bad men, are all under the controul of Him who governs the intellectual as well as material world by fixed and equal laws.—Theſe details of ſuperſtition, however, will not be uſeleſs, if, by ſhowing how poor and wretched a creature man becomes when left to his own inventions, they ſhall make any one grateful for the benefits of good government, and the bleſſings of revealed religion.

NECROPOLIS, a ſuburb of Alexandria in Egypt. It ſignifies "the City of the Dead;" wherein there were temples, gardens, and ſuperb mauſoleums. Here Cleopatra is ſaid to have applied the aſpic to her breaſt, to prevent being led in triumph by Auguſtus, who endeavoured to ſave her.

NECROSIS, νεκρωσις, in medicine, a complete mortification of any part; called alſo *ſideratio* and *ſphacelus.*

NECTANEBUS, or Nectamabis, a king of Egypt, who defended his country againſt the Perſians. His grandſon of the ſame name made an alliance with Ageſilaus king of Sparta, and with his aſſiſtance he quelled a rebellion of his ſubjects. Sometime after he was joined by the Sidonians, Phœnicians and inhabitants of Cyprus, who had revolted from the king of Perſia. This powerful confederacy was ſoon attacked by Darius the king of Perſia, who marched at the head of his troops. Nectanebus, to defend his frontiers againſt ſo dangerous an enemy, levied 20,000 mercenary ſoldiers in Greece, the ſame number in Libya, and 60,000 were furniſhed in Egypt. This numerous body was not equal to the Perſian forces, and Nectanebus, defeated in a battle, gave up all hopes of reſiſtance, and fled into Ethiopia, where he found a ſafe aſylum. His kingdom of Egypt became from that time tributary to the king of Perſia.

NECTAR, among ancient poets, the drink of the fabulous deities of the heathens; in contradiſtinction from their ſolid food, which was called *ambroſia.*

NECTARINE, a fruit differing in nothing from the common peach, of which it is a ſpecies, than in having a ſmoother rind and a firmer pulp. See Persica.

NECTARIUM, from *nectar*, the fabled "drink of the gods;" defined by Linnæus to be a part of the corolla, or appendage to the petals, appropriated for containing the honey, a ſpecies of vegetable ſalt under a fluid form, that oozes from the plant, and is the principal food of bees and other inſects.

Notwithſtanding this definition which ſeems to conſider the nectarium as neceſſary a part of the corolla as the petals; it is certain that all flowers are not provided with this appendage, neither indeed is it eſſential to fructification.

There is, beſides a manifeſt impropriety in terming the nectarium a part of the corolla. Linnæus might with equal propriety, have termed it a part or appendage of the ſtamina, calyx, or pointal, as the appearance in queſtion is confined to no particular part of the flower, but is as various in point of ſituation as of form. The truth is, the term *nectarium* is exceedingly vague: and, if any determinate meaning can be affixed to it, is expreſſive of all the ſingularities which are obſerved in the different parts of flowers.

Milne's Bot. Dict.

The tube, or lower part of flowers with one petal, Linnæus conſiders as a true nectarium, becauſe it is generally found to contain the ſweet liquor formerly mentioned. This liquor Pontedera compares to that called *amnios* in pregnant animals, which enters the fertile or impregnated ſeeds: but that this is not at leaſt its ſole uſe, is evident from this circumſtance, that the honey or liquor in queſtion is to be found in flowers where there are either no ſeeds, or thoſe which, from the want of male organs, cannot be impregnated. Thus the male flowers of nettle and willow, the female flowers of ſea-ſide laurel and black bryony, the male and female flowers of clutia, higgelaria, and butcher's broom, all abound with the honey or nectar alluded to.

Dr Vaillan was of opinion, that the nectarium was an eſſential part of the corolla; for which reaſon he diſtinguiſhed the ſingular appearances in fennel-flower and columbine by the name of *petals:* the coloured leaves which are now termed the *petals* he denominates the *flower cup.*

That the nectarium, however, is frequently diſtinct from the petals, is evident, both from the well known examples juſt mentioned, as likewiſe from the flowers of monkſhood, hellebore, iſopyrum, fennel-flower of Crete, barrenwort, graſs of Parnaſſus, chocolate-nut, cherleria and ſauvageſia.

Theſe general obſervations being premiſed, we proceed to take a nearer and more particular view of the principal diverſities, both in form and ſituation, of this ſtriking appendage to the flower. 1. In many flowers the nectarium is ſhaped like a ſpur or horn; and that either in flowers of one petal, as valerian, water-milfoil *(articularia)*, butter-wort, and calves ſnout; or in ſuch as have more than one, as lark-ſpur, violet, fumatory, balſam, and orchis. 2. In the following plants, the nectarium is properly a part of the corolla, as lying within the ſubſtance of the petals: ranunculus, lily, iris, crown-imperial, water-leaf, mouſe-tail, ananas or pine apple, dog's-tooth violet, piperidge buſh, valiſneria, hermannia, uvularia, and ſwertia. 3. The nectarium is frequently placed in a ſeries or row within the petals, though entirely unconnected with their ſubſtance. In this ſituation it often reſembles a cup, as in narciſſus. A nectarium of this kind is ſaid by Linnæus to crown the corolla. The following are examples: daffodil, ſea-daffodil, campion, viſcous campion,

pion, ſwallow-wort, ſtapelia, cynanchum, nepenthes, cherleria, balſam-tree, African ſpiræa, witch-hazel-olax, and paſſion-flower. 4. In Indian creſs, buckler, muſtard, Barbadoes cherry, and monotropa, the nectarium is ſituated upon or makes part of the calyx. 5. The nectarium in baſtard flower-fence is ſeated upon the antheræ or tops of the ſtamina; whence the name *adenanthera*, or *glandular anthera*, which has been given to this genus of plants. In the following liſt it is placed upon the filaments; bean-caper, bay, fraxinella, marvel of Peru, bell-flower, lead-wort, roella, and commelina. 6. In hyacinth, flowering-ruſh, ſtock July-flower, and rocket, the nectarium is placed upon the ſeed-bud. 7. In honey-flower, orpine, buckwheat, collinſonia, lathræa, navel-wort, mercury, clutia, kiggelaria, ſea-ſide laurel, and African ſpiræa, it is attached to the common receptacle. Laſtly, in ginger, nettle, dyer's weed, heart-ſeed, coſtus, turmeric, grewia, baſtard orpine, vanelloe, ſkrew-tree, and willow, the nectarium is of a very ſingular conſtruction, and cannot properly fall under any of the foregoing heads.

In diſcriminating the genera, the nectarium often furniſhes an eſſential character.

Plants which have the nectarium diſtinct from the petals, that is, not lodged within their ſubſtance, are affirmed by Linnæus to be generally poiſonous. The following are adduced as examples: monk's-hood, hellebore, columbine, fennel-flower, graſs of Parnaſſus, barren-wort, oleander, marvel of Peru, bean-caper, ſucculent ſwallow-wort, fraxinella, and honey-flower.

NECUIA, in botany, a name given by the ancient Greeks to a ſpecies of mullein.

The Greeks and Romans both uſed the ſtalks of a peculiar kind of mullein, called *thryallis* by Nicander. For the making of wicks of lamps we have a kind of mullein called *lychnites*, and candle-wick mullein, from the λυχνιτις of Dioſcorides; but it is not certain that ours is the ſame plant.

The ancients uſed the ſtalks of many different plants for the wicks of their candles and lamps. The ruſh, ſtripped of its bark, was as commonly in uſe with them as with the moderns for this purpoſe; and they alſo uſed the nettle, this mullein, and many other plants, whoſe ſtalks were compoſed of tough filaments for the ſame purpoſe; beating them out like hemp, and when dry dipping them in melted reſin, and other ſuch inflammable ſubſtances. When thus prepared, they are readily inflammable, like our flambeau; and this mullein, having ſtalks more long and large, and more firm than all the others, was uſed to make thoſe lights with which they ſet fire to the funeral pile, for conſuming the aſhes of their dead friends.

NECYDALIS, in zoology, a genus of inſects belonging to the order of coleoptera. The feelers are ſetaceous; the elytra are ſhorter and narrower than the wings; the tail is ſimple. There are 11 ſpecies, chiefly diſtinguiſhed by the ſize and figure of their elytra. Barbut ſays, "Its head is black, eyes are large and prominent, jaws are of a dark brown. The antennæ placed on the top of the head between the eyes have their firſt articulation long and raiſed upright, the reſt bent and turned aſide. The antennæ vary as to length and colour. In individuals whoſe thorax are yellow, they are brown, and equal only to two-thirds of the body in length. On the contrary, in thoſe whoſe thorax is black, they are likewiſe black, and ſomewhat longer than the body. The thorax is margined; in ſome it is yellow and longer; in others it is black, ſhorter, and edged only with a little yellow. The elytra are blackiſh, ſomewhat clearer in the middle, and terminating in a lemon coloured ſpot. The wings are rather black, ſomething longer than the body, exceed the elytra by one-third, and are croſſed one over the other. In thoſe that have their thorax yellow, the legs and under part of the belly are ſo likewiſe. In individuals with a black thorax, the legs are black as well as the belly, which has only a little yellow on the ſides. I ſuſpect the latter to be the males. The larva is as yet unknown."

NEDHAM (Marchmont), an Engliſh ſatyrical writer, was born at Burford Oxon. about the month of Auguſt 1620. His father died in 1621; but the following year his mother was again married to one Chriſtopher Glynn, vicar and ſchoolmaſter of Burford; who perceiving his ſon-in-law's pregnancy of parts and genius, took him under his own tuition, and at the age of 14 ſent him to All Soul's College, Oxon. Here he was made one of the choriſters, and continued till 1637, when having taken the degree of A. B. which made it inconſiſtent to continue in that office, he went to St Mary's Hall till he became an uſher in Merchant Taylor's ſchool, London. About the beginning of the civil wars, he became clerk to an attorney at Gray's Inn, where, writing a good court hand, he obtained a decent ſubſiſtence. Not long after this he began a weekly paper, under the title of *Mercurius Britannicus*, on the ſide of the parliament: it commenced about the middle of Auguſt 1643, coming out on Mondays, in one ſheet, and continued till the end of 1646. It procured him popularity, and being an active man he was diſtinguiſhed by the title of Capt. Nedham of Gray's Inn. Of theſe mercuries (for there were a number of them publiſhed on both ſides of the great queſtion which then divided the nation) it is well obſerved by Johnſon, that they taught many to talk whom they could not teach to judge. Nedham's was, indeed, addreſſed as much to the paſſions as the reaſon; and, by telling every man that he was equal to his king, he ſo flattered vulgar pride, that his licentious opinions were received as the dictates of an oracle. About this time he ſtudied phyſic, and in 1645 began to practiſe; by which, and his political writings, he ſupported a genteel figure. But, for ſome ſcorn and affront put upon him, he ſuddenly left his party, and, obtaining the favour of a royaliſt, was introduced into the king's preſence at Hampton-court in 1647, and aſking pardon upon his knees readily obtained it; ſo that being admitted to the king's favour, he wrote ſoon after another paper, entitled *Mercurius Pragmaticus;* which being equally witty with the former, as ſatirical againſt the Preſbyterians, and full of loyalty, made him known and admired by the wits of that ſide. However, being narrowly ſought after, he left London, and for a time lay concealed at the houſe of Dr Peter Heylin, at Minſter Lovel, near Burford, till at length being diſcovered, he was impriſoned in Newgate, and in danger of his life. Lenthal, the ſpeaker of the houſe of Commons, who knew him and his relations

relations well, and Bradſhaw, preſident of the high court of juſtice, treated him favourably, and not only got his pardon, but with promiſe of rewards and places perſuaded him to change his ſide once more for the independents, who then were the uppermoſt party.—In this temper he publiſhed a third weekly paper, called *Mercurius Politicus*, which came out every Wedneſday, in two ſheets 4to, commencing with the 9th of June 1649, and ending with the 6th of June 1650, which being Thurſday, he began again with number 1. from Thurſday June 6, to Thurſday June 13, 1650, beginning, "Why ſhould not the commonwealth have "a fool, as well as the king had, &c." This paper, which contained many diſcourſes againſt monarchy, and in behalf of a free ſtate, eſpecially thoſe that were publiſhed before Cromwell was made protector, was carried on without any interruption till about the middle of April 1660, when, as ſeveral times before, it was prohibited by an order of the council of ſtate.—Upon the return of Charles II. our author lay hid, till, by virtue of ſome money well placed, he obtained his pardon under the great ſeal; after which he exerciſed the faculty of phyſic among the Diſſenters, which brought him in a conſiderable benefit till his death, which happened ſuddenly in 1678. Wood, who knew him, tells us that he was a perſon endowed with quick natural parts, was a good humaniſt, poet, and boon droll; and, had he been conſtant to his cavaliering principles, would have been beloved and admired by all; but being mercenary, and preferring his intereſt to his conſcience, friendſhip, and love to his prince, was much hated by the royal party to the laſt. In ſhort, there was no depending on this ſcurrilous ill-natured author. He followed whenever intereſt or paſſion led, and remains a notorious inſtance of the danger of brilliant parts, of which he certainly was poſſeſſed, without judgment or integrity to controul them. Wood, who in his Athen. Oxon. quoted above, gives a very copious account of him, ſays: "At length this moſt ſeditious, mutable, and railing "author, M. Nedham, died ſuddenly, in the houſe "of one Kidder, in D'Eureux-court near Temple-"bar, London, in 1678, and was buried near the "entrance of the chancel of the church of St Cle-"ments Danes."

Athen. Oxon. vol. ii.

NEEDHAM (John Tuberville), was born at London the 10th of September in the year 1713. His parents were deſcended from ancient and noble families. His father, who had once poſſeſſed a conſiderable patrimony at Hilſton, in the county of Monmouth, was of the younger and Catholic branch of the Needham family: the head of the elder and Proteſtant branch was lord Kilmory, created viſcount in the year 1625. The father of Mr Needham died young, and left but a ſmall fortune to his four children. His eldeſt ſon, who is the ſubject of this article, proſecuted his ſtudies under the ſecular clergy of the Engliſh college of Douai, where he took orders, taught rhetoric for ſeveral years, gave eminent proofs of ſagacity and genius, and ſurpaſſed all the other profeſſors of that ſeminary in the knowledge of experimental philoſophy. In 1740, he was engaged by his ſuperiors in the ſervice of the Engliſh miſſion, and was entruſted with the direction of the ſchool erected at Twyford, near Wincheſter, for the education of the Roman Catholic youth. In 1744, he was appointed profeſſor of philoſophy in the Engliſh college at Liſbon, where, on account of his bad health, he remained only 15 months. After his return, he paſſed ſeveral years at London and Paris, which were principally employed in microſcopical obſervations and in other branches of experimental philoſophy. The reſults of theſe obſervations and experiments were publiſhed in the Philoſophical Tranſactions of the Royal Society of London in 1749, and in a volume in 12mo at Paris in 1750; and an account of them was alſo given by M. de Buffon, in the firſt volumes of his Natural Hiſtory There was an intimate connection between this illuſtrious French naturaliſt and Mr Needham: they made their experiments and obſervations together; though the reſults and ſyſtems which they deduced from the ſame objects and operations were totally different. Mr Needham was admitted to a place in the Royal Society of London in the year 1747, and in the Antiquarian Society ſome time after. From the year 1751 to 1767 he was chiefly employed in finiſhing the education of ſeveral Engliſh and Iriſh noblemen, by attending them as tutor in their travels through France, Italy, and other countries. He then retired from this wandering life to the Engliſh ſeminary at Paris, and in 1768 was choſen by the Royal Academy of Sciences in that city a correſponding member.

When the regency of the Auſtrian Netherlands, in order to the revival of philoſophy and literature in that country, formed the project of an Imperial academy, which was preceded by the erection of a ſmall literary ſociety to prepare the way for its execution, Mr Needham was invited to Bruſſels by Count Cobentzel and the preſident Neny, and was appointed ſucceſſively chief director of both theſe foundations. He held this place, together with ſome eccleſiaſtical preferments in the Low Countries, until his death, which happened the 30th of December 1781. "His piety, temperance, and purity of manners (we follow the expreſſion of of the Abbé Mann) were eminent: his attachment to the doctrines and duties of Chriſtianity was inviolable. His zealous oppoſition to modern infidels was indefatigable and even paſſionate. His probity was untainted. He was incapable of every ſpecies of duplicity; his beneficence was univerſal, and his unſuſpicious candour rendered him often a dupe to perfidy." Theſe and other good qualities the panegyriſt attributes to his deceaſed friend; and the learned authors of the Monthly review, to whom Mr Needham was known, admit the juſtneſs of the panegyric. He was undoubtedly (ſay they) both an honeſt man and a worthy citizen; but though his death be a real loſs to the literary world, yet he died ſeaſonably for himſelf; for had he lived to ſee Joſeph the IId. and the Great making ſo free with the paint, patches, and trinkets of the mother church, confiſcating her lands, aboliſhing her convents, ſuppreſſing her holidays, introducing common ſenſe into her worſhip, erecting political conductors to diſperſe the thunder of the vatican, and atchieving many other things in this ſtyle of improvement, it would have vexed full ſore his feeling heart. For this honeſt man was narrow even to ſuperſtition and bigotry in his religious ſyſtem; and we never knew a man in whom there was ſuch an unacconntable mixture of implicit faith and philoſophical curioſity as in Mr Needham. He was a keen and judicious obſerver of nature, had a peculiar dexterity in confirming his obſervations by experiments, and he was always occupied (ſometimes indeed with too much fancy and precipitation) in generalizing facts, and reducing them to his ſyſtem. "His pen (ſays Abbé Maun) was neither remarkable for fecundity nor method; his writings are rather the great lines of a ſubject expreſſed with energy, and thrown upon paper in a hurry, than finiſhed treatiſes." His works are well known both in Britain and in France.

NEEDHAM, in Suffolk, 73 miles from London, ſtands on the Orwell, 9 miles from Ipſwich, in the road to Huntingdonſhire. Its market is on Wedneſday, and fair in October 28.

NEEDLE, a very common little inſtrument or utenſil made of ſteel, pointed at one end, and pierced at the other, uſed in ſewing, embroidery, tapeſtry, &c.

Needles make a very conſiderable article in commerce, though there is ſcarce any commodity cheaper, the conſumption of them being almoſt incredible.—The ſizes are from n° 1. the largeſt, to n° 25. the ſmalleſt. In the manufacture of needles, German and Hungarian ſteel are of moſt repute.

In the making of them, the firſt thing is to paſs the ſteel through a coal fire, and under a hammer, to bring it out of its ſquare figure into a cylindrical one. This done, it is drawn through a large hole of a wire-drawing iron, and returned into the fire, and drawn through a ſecond hole of the iron ſmaller than the firſt; and thus ſucceſſively from hole to hole, till it has acquired the degree of fineneſs required for that ſpecies of needles: obſerving every time it is to be drawn, that it be greaſed over with lard, to render it more manageable. The ſteel thus reduced to a fine wire, is cut in pieces of the length of the needles intended. Theſe pieces are flatted at one end on the anvil, in order to form the head and eye: they are then put into the fire, to ſoften them farther; and thence taken out and pierced at each extreme of the flat part on the anvil, by force of a puncheon of well-tempered ſteel, and laid on a leaden block to bring out, with another puncheon, the little piece of ſteel remaining in the eye. The corners are then filed off the ſquare of the heads, and a little cavity filed on each ſide of the flat of the head; this done, the point is formed with a file, and the whole filed over: they are then laid to heat red hot on a long narrow iron, crooked at one end, in a charcoal fire; and when taken out thence, are thrown into a baſon of cold water to harden. On this operation a good deal depends; too much heat burns them, and too little leaves them ſoft; the medium is learned by experience. When they are thus hardened, they are laid in an iron ſhovel on a fire more or leſs briſk in proportion to the thickneſs of the needles; taking care to move them from time to time. This ſerves to temper them, and take off their brittleneſs; great care here too muſt be taken of the degree of heat. They are then ſtraigthened one after another with the hammer, the coldneſs of the water uſed in hardening them having twiſted the greateſt part of them.

The next proceſs is the poliſhing them. To do this, they take 12,000 or 15,000 needles, and range them in little heaps againſt each other on a piece of new buckram ſprinkled with emery-duſt. The needles thus diſpoſed, emery-duſt is thrown over them, which is again ſprinkled with oil of olives; at laſt the whole is made up into a roll, well bound at both ends. This roll is then laid on a poliſhing table, and over it a thick plank loaded with ſtones, which two men work backwards and forwards a day and a half, or two days, ſucceſſively; by which means the roll thus continually agitated by the weight and motion of the plank over it, the needles withinſide being rubbed againſt each other with oil and emery, are inſenſibly poliſhed. After poliſhing, they are taken out, and the filth waſhed off them with hot water and ſoap: they are then wiped in hot bran, a little moiſtened, placed with the needles in a round box, ſuſpended in the air by a cord, which is kept ſtirring till the bran and needles be dry. The needles thus wiped in two or three different brans, are taken out and put in wooden veſſels, to have the good ſeparated from thoſe whoſe points or eyes have been broken either in poliſhing or wiping; the points are then all turned the ſame way, and ſmoothed with an emery ſtone turned with a wheel. This operation finiſhes them, and there remains nothing but to make them into packets of 250 each. Needles were firſt made in England by a native of India in 1545, but the art was loſt at his death; it was, however, recovered by Chriſtopher Greening in 1560, who was ſettled with his three children, Elizabeth, John, and Thomas, by Mr Damar, anceſtor of the preſent Lord Milton, at Long Crendon in Bucks, where the manufactory has been carried on from that time to this preſent day.

Plate CCCXLV. fig. 1.

Dipping-NEEDLE, or *Inclinatory Needle*, a magnetical needle, ſo hung, as that, inſtead of playing horizontally, and pointing out north and ſouth, one end dips, or inclines to the horizon, and the other points to a certain degree of elevation above it.

The dipping needle was invented in the year 1576 by one Robert Norman a compaſs-maker at Wapping. The occaſion of the diſcovery, according to his own account, was, that it being his cuſtom to finiſh and hang the needles of his compaſſes before he touched them, he always found, that immediately after the touch the north-point would bend or incline downward under the horizon; inſomuch that, to balance the needle again, he was always forced to put a piece of wax on the ſouth end as a counterpoiſe. The conſtancy of this effect led him at length to obſerve the preciſe quantity of the dip, or to meaſure the greateſt angle which the needle would make with the horizon; and this at London he found to be 71° 50′. In 1723 Mr Graham made a great many obſervations on the dipping-needle, and found the angle to be between 74 and 75 degrees. Mr Nairne, in 1772, found it to be ſomewhat above 72°. It is not certain whether the dip varies, as well as the horizontal direction, in the ſame place. The trifling difference between Mr Forman and Mr Nairne would lead us to imagine that the dip was unalterable; but Mr Graham, who was a very accurate obſerver, makes the difference more conſiderable. It is certain, however, from a great number of experiments and obſervations, that the dip is variable in different latitudes, and that it increaſes in going northwards. It appears from a table of obſervations made with the marine dipping-needle in a voyage towards In the north pole in 1733, that in lat. 60. 18. the dip was 75°; and in lat. 70. 45. it was 77° 52′; in lat. 80. 12. it was 81° 52′; and in lat. 80. 27. it was 82° 2½′.

Several authors have endeavoured to apply this diſcovery of the dip to the finding of the latitude; and Mr Bond attempted to apply it to the finding of the longitude alſo; but for want of obſervations and experiments he could not make any progreſs. The affair was farther proſecuted by Mr Whiſton, who publiſhed a treatiſe on the longitude, and for ſome time imagined it was poſſible to find it exactly by means of the dip of the needle; yet he at laſt deſpaired of it, for the following reaſons. 1. The weakneſs of the magnetic power. 2. The concuſſion of the ſhip, which he found it exceeding difficult to avoid ſo much as was neceſſary for the accuracy of the experiments. 3. The principal objection was an irregularity in the motions of all magnetic needles, both horizontal and dipping, by which they, within the compaſs of about a degree, vary uncertainly backward and forward; even ſometimes, in a few hours time, without any evident cauſe. For a particular account of theſe variations both of the horizontal and dipping needle, ſee the article Variation.

Mr Nairne made a dipping-needle in 1772 for the board of longitude, which was uſed in the voyage towards the north-pole. This is repreſented Plate CCCXLV. fig. 2. The needle AA is 12 inches long, and its axis, the ends BB of which are made of gold alloyed with copper, reſts on friction-wheels CCCC, of four inches diameter, each end on two friction-wheels; which wheels are balanced with great care. The ends of the axes of the friction-wheels are likewiſe of gold alloyed with copper, and moved in ſmall holes made in bell-metal: and oppoſite to the ends of the axes of the needle and the friction-wheels, are flat agates, ſet in at DDD, finely poliſhed. The magnetic needle vibrates within a circle of bell-metal, EEE, divided into degrees and half degrees; and a line, paſſing through the middle of the needle to the ends, points to the diviſions. The needle of this inſtrument was balanced before it was made magnetical; but by means of a croſs, the ends of which are FFFF, (contrived by the reverend Mr Mitchell) fixed on the axis of the needle, on the arms of which are cut very fine ſcrews to receive ſmall buttons, that may be ſcrewed nearer or farther from the axis, the needle may be adjuſted both ways to a great nicety, after being made magnetical, by reverſing the poles, and changing the ſides of the needle. GG are two levels, by which the line of 0 degrees of the inſtrument is ſet horizontal, by means of the four adjuſting ſcrews LLLL; H is the perpendicular axis by which the inſtrument may be turned, that the divided face of the circle may front the eaſt or weſt; to this axis is fixed an index I, which points to an oppoſite line on the horizontal plate K when the inſtrument is turned half round; MMMM are ſcrews which hold the glaſs-cover to keep the needle from being diſturbed by the wind. When this needle is conſtructed for ſea, it is ſuſpended by an univerſal joint on a triangular ſtand, and adjuſted vertically by a plumb-line and button above the divided circle and the dovetail work at the upper 90; and the diviſions on the circle are adjuſted ſo as to be perpendicular to the horizon by the ſame plumb-line, and an adjoining ſcrew; and when it is adjuſted, a pointer annexed to a ſcrew, which ſerves to move the divided circle, is fixed at the loweſt 90. Whenever the inſtrument is uſed to find the dip, it muſt be ſo placed that the needle may vibrate exactly in the magnetic meridian.

Magnetical Needle, in navigation, a needle touched with a loadſtone, and ſuſtained on a pivot or centre: on which playing at liberty, it directs itſelf to certain points in or under the horizon: whence the magnetical needle is of two kinds, viz, horizontal or inclinatory. See the article Magnet.

Horizontal needles are thoſe equally balanced on each ſide of the pivot that ſuſtains them; and which playing horizontally with their two extremes, point out the north and ſouth points of the horizon. For their application and uſe, ſee the article Compass.

In the conſtruction of the horizontal needle, a piece of pure ſteel is provided; of a length not exceeding ſix inches, leſt its weight ſhould impede its volubility; very thin, to take its verticity the better; and not pierced with any holes, or the like, for ornament ſake, which prevent the equable diffuſion of the magnetic virtue. A perforation is then made in the middle of its length, and a braſs cap or head ſoldered on, whoſe inner cavity is conical, ſo as to play freely on a ſtyle or pivot headed with a fine ſteel point. The north point of the needle in our hemiſphere is made a little lighter than the ſouthern: the touch always deſtroying the balance, if well adjuſted before, and rendering the north end heavier than the ſouth, and thus occaſioning the needle to dip.

The method of giving the needle its verticity or directive faculty has been ſhown already under the article Magnet; but if, after touching, the needle be out of its equilibrium, ſomething muſt be filed off from the heavier ſide, till it balance evenly.

Needles in ſea compaſſes are uſually made of a rhomboidal or oblong form: we have given their ſtructure already under the article Compass.

The needle is not found to point preciſely to the north, except in very few places; but deviates from it more or leſs in different places, and that too at different times; which deviation is called its *declination* or *variation from the meridian.* See the article Variation.

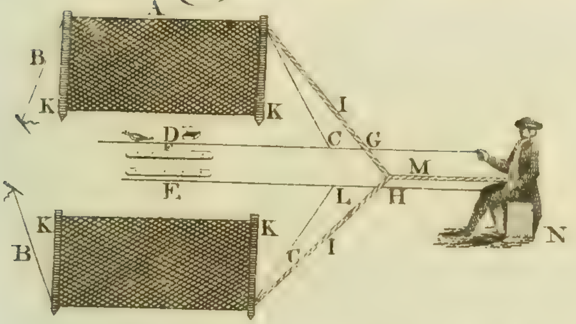
Surgeons Needles are generally made crooked, and their points triangular; however they are of different forms and ſizes, and bear different names, according to the purpoſes they are uſed for.

The largeſt are needles for amputation; the next, needles for wounds; the fineſt needles for ſutures. They have others very ſhort and flat, for tendons; others, ſtill ſhorter, and the eye placed in the middle, for tying together of veſſels, &c. Needles for couching cataracts are of various kinds; all of which have a ſmall, broad, and ſharp point or tongue; and ſome with a ſulcus at the point. Surgeons have ſometimes uſed two needles in this operation; one with a ſharp point for perforating the coats of the eye, and another with a more obtuſe point for depreſſing or couching the opaque cryſtalline lens: but care ſhould be taken in the uſe of any of theſe, that they be firſt well poliſhed with cloth or leather, before they are applied to the eye.

Mr Warner obſerves, that the blade of the couching needle

Plate CCCXLV.

Day Nett.



Dipping Needle.

Fig. 2.

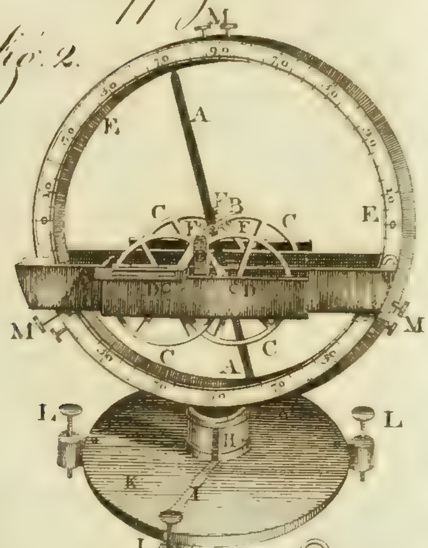
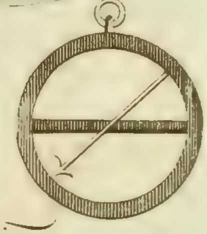


Fig. 1.



Newtonian Philosophy.

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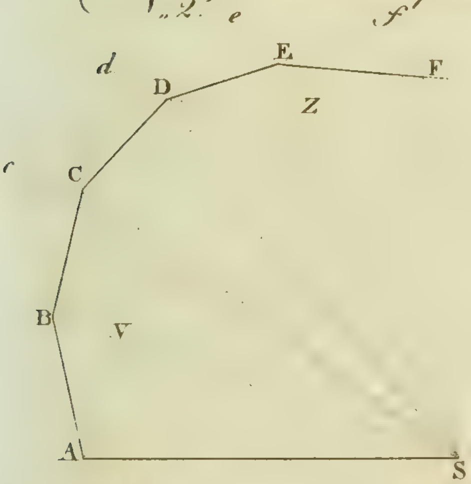

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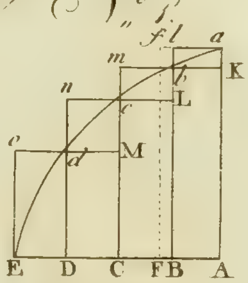


Nereis.

Fig. 1.

Fig. 2.

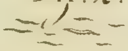


Fig. 3.

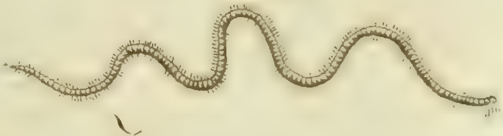
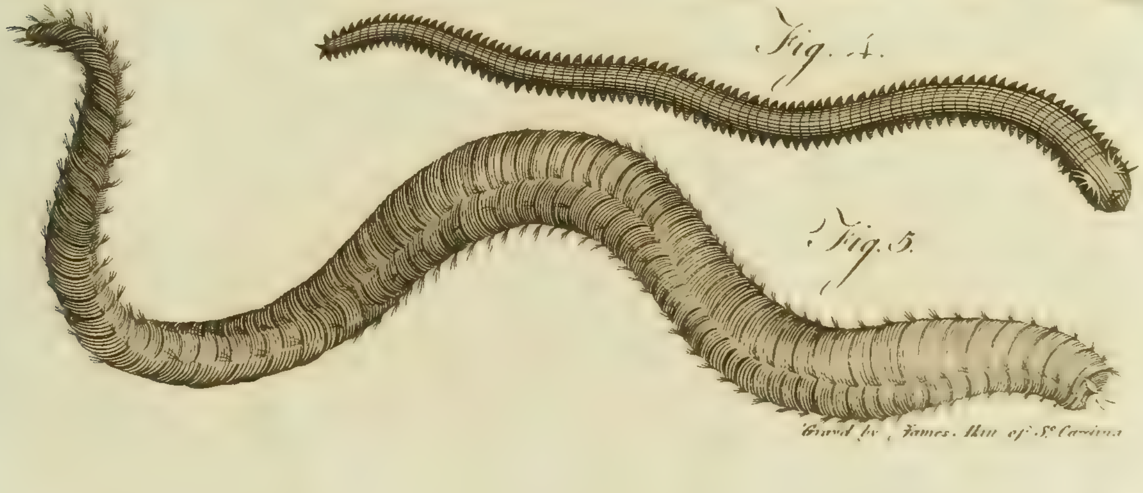


Fig. 4.

Fig. 5.



Grav'd by James Hill of S.t Carina

needle ſhould be at leaſt a third part larger than thoſe generally uſed upon this occaſion, as great advantages will be found in the depreſſing of the cataract, by the increaſed breadth of the blade of that inſtrument. The handle, alſo, if made ſomewhat ſhorter than uſual, will enable the operator to perform with greater ſteadineſs, than he can do with a larger handled inſtrument.

It is to be obſerved, that needles of ſilver pierce more eaſily in ſtitching arteries after an amputation, than thoſe made of ſteel.

Needle Fiſh. See Sygnathus.

Needles, ſharp-pointed rocks north of the Iſle of Wight. They are ſituated at the weſtern extremity of the iſland, which is an acute point of high land, from which they have been disjoined by the waſhing of the ſea. There were of theſe lofty white rocks formerly three, but about 14 years ago the talleſt of them, called *Lot's Wife*, which aroſe 120 feet above low-water mark, and in its ſhape reſembling a needle, being undermined by the conſtant efforts of the waves, overſet, and totally diſappeared.

NEEDS, or St Neots, ſix miles from Huntingdon, 58 miles from London, ſo called from the monument of a ſaint of that name in it, who was burnt by the Danes, is a large well-built town, having a handſome ſtrong church, with a prodigious fine ſteeple, and a good ſtone-bridge over the Ouſe, by which coals are brought to it, and ſold through the country. It has a charity-ſchool for 25 poor children. Its market is on Thurſday; fairs on Holy Thurſday, Aug. 1. Corpus-Chriſti Thurſday, June 13, and December 17.; and it is famous for a medicinal ſpring.

NEEDWOOD-forest, in Staffordſhire, between the Trent, Dove, and Blythe, and near Uttoxeter, is ſaid to exceed all the foreſts in England in the excellency of its ſoil and the fineneſs of its turf.

NE EXEAT REGNO, in law, is a writ to reſtrain a perſon from going out of the kingdom without the king's licence. F. N. B. 85. It may be directed to the ſheriff, to make the party find ſurety that he will not depart the realm, and on refuſal to commit him to priſon: or it may be directed to the party himſelf; and if he then goes, he may be fined. And this writ is granted on a ſuit being commenced againſt a man in the chancery, when the plaintiff fears the defendant will fly to ſome other country; and thereby avoid the juſtice and equity of the court; which hath been ſometimes practiſed: and when thus granted, the party muſt give bonds to the maſters of the rolls, in the penalty of 1000l. or ſome other large ſum; for yielding obedience to it; or ſatisfy the court, by anſwer, affidavit, or otherwiſe, that he hath no deſign of leaving the kingdom, and give ſecurity.

NEFERN, in Pembrokeſhire, a village in whoſe church-yard is a remarkable old croſs. The church has no pavement in it, and the frequent burials have raiſed the ground within it to ſeven or eight feet higher than without. In proceſs of time, inſtead of a church, it will be only a ſepulchre. It is pleaſantly ſituated on the banks of a river of the ſame name near Newport.

NEFASTI dies, in Roman antiquity, an appellation given to thoſe days wherein it was not allowed to adminiſter juſtice, or hold courts. They were ſo called becauſe, *non fari licebat*, the prætor was not allowed to pronounce the three ſolemn words or formulas of the law, *do*, *dico*, *addico*, I give, I appoint, I adjudge. Theſe days were diſtinguiſhed in the calendar by the letter N. for *nefaſtus*; or N. P. *Nefaſtus Primo*, when the day was only *nefaſtus* in the forenoon, or firſt part. The days of a mixed kind were called *intercifi*.

NEGAPATAN, a town of Aſia in the peninſula on this ſide the Ganges, and on the coaſt of Coromandel. It was firſt a colony of the Portugueſe, but was taken from them by the Dutch. The factory purchaſe very little beſides tobacco and long linen cloths: however, the Dutch have thought proper to erect a fort here. It is ſituated in E. Long. 79. 10 N. Lat. 11. 15.

NEGATION, in logic, an act of the mind affirming one thing to be different from another: as that the ſoul is not matter. See Logic.

NEGATIVE, in general, ſomething that implies a negation: thus we ſay, negative quantities, negative powers, negative ſigns, &c.

Negative-Sign. The uſe of the negative ſign, in algebra, is attended with ſeveral conſequences that at firſt ſight are admitted with difficulty, and has ſometimes given occaſion to notions that ſeem to have no real foundation. This ſign implies, that the real value of the quantity repreſented by the letter to which it is prefixed is to be ſubtracted; and it ſerves, with the poſitive ſign, to keep in view what elements or parts enter into the compoſition of quantities, and in what manner, whether as increments or decrements, (that is, whether by addition or ſubtraction), which is of the greateſt uſe in this art.

In conſequence of this, it ſerves to expreſs a quantity of an oppoſite quality to the poſitive, as a line in a contrary poſition; a motion with an oppoſite direction; or a centrifugal force in oppoſition to gravity; and thus often ſaves the trouble of diſtinguiſhing, and demonſtrating ſeparately, the various caſes of proportions, and preſerves their analogy in view. But as the proportions of lines depend on their magnitude only, without regard to their poſition, and motions and forces are ſaid to be equal, or unequal, in any given ratio, without regard to their directions; and, in general, the proportion of quantity relates to their magnitude only, without determining whether they are to be conſidered as increments or decrements; ſo there is no ground to imagine any other proportion of $-b$ and $+a$ (or of -1 and 1) than that of the real magnitudes of the quantities repreſented by b and a, whether theſe quantities are, in any particular caſe, to be added or ſubtracted. It is the ſame thing to ſubtract a decrement, as to add an equal increment, or to ſubtract $-b$ from $a-b$, as to add $+b$ to it: and becauſe multiplying a quantity by a negative number implies only a repeated ſubtraction of it, the multiplying $-b$ by $-n$, is ſubtracting $-b$ as often as there are units in n; and is therefore equivalent to adding $+b$ ſo many times, or the ſame as adding $+nb$. But if we infer from this, that 1 is to $-n$ as $-b$ to nb, according to the rule, that unit is to one of the factors as the other factor is to the product, there is no ground to imagine that there is any myſtery in this, or any other meaning than that the real magnitudes repreſented by 1, n, b, and nb are proportional. For that rule relates only to the magnitude of the factors and product, without determining whether any factor, or the product, is to be added or ſubtracted. But this likewiſe muſt be determined in algebraic computations; and this is the proper uſe of the rules concerning the ſigns, without which the operation could not proceed. Becauſe a quantity to be ſubtracted is never produced in compoſition by any repeated addition of a poſitive, or repeated ſubtraction of a negative, a negative ſquare number is never produced by compoſition from the root. Hence $\sqrt{-1}$, or the ſquare root of a negative, implies an imaginary quantity; and, in reſolution, is a mark or character of the impoſſible caſes of a problem, unleſs it is compenſated by another imaginary ſymbol or ſuppoſition, when the whole expreſſion may have a real ſignification. Thus $1+\sqrt{-1}$, and $1-\sqrt{-1}$ taken ſeparately, are imaginary, but their ſum is 2; as the conditions that ſeparately would render the ſolution of a problem impoſſible, in ſome caſes deſtroy each others effect when conjoined. In the purſuit of general concluſions, and of ſimple forms repreſenting them, expreſſions of this kind muſt ſometimes ariſe where the imaginary ſymbol is compenſated in a manner that is not always ſo obvious.

By proper ſubſtitutions, however, the expreſſion may be transformed into another, wherein each particular term may have a real ſignification as well as the whole expreſſion. The theorems that are ſometimes briefly diſcovered by the uſe of this ſymbol, may be demonſtrated without it by the inverſe operation, or ſome other way; and though ſuch ſymbols are of ſome uſe in the computations by the method of fluxions, its evidence cannot be ſaid to depend upon arts of this kind. See Maclaurin's Fluxions, book ii. chap. 1. and Ludlam's Algebra, *paſſim*.

NEGATIVE *Electricity*. See the article ELECTRICITY. *paſſim*. See alſo POSITIVE *Electricity*.

NEGINOTH. This term is read before ſome of the Pſalms, as Pſalm lxvii. It ſignifies *ſtring inſtruments of muſic*, to be played on by the fingers, or women-muſicians; and the titles of thoſe pſalms where this word is found, may be thus tranſlated, *A pſalm of David to the maſter of muſic, who preſides over the ſtring-inſtruments*.

NEGOMBO, a ſea-port town of Aſia, on the weſt coaſt of Ceylon. It has a fort built by the Portugueſe, which was taken from them by the Dutch in 1640. E. Long. 80. 25. N. Lat. 17. 0.

NEGRIL POINT, the moſt weſterly promontory of the iſland of Jamaica.

NEGRO, *Homo pelli nigra*, a name given to a variety of the human ſpecies, who are entirely black, and are found in the Torrid zone, eſpecially in that part of Africa which lies within the tropics. In the complexion of negroes we meet with many various ſhades; but they likewiſe differ far from other men in all the features of their face. Round cheeks, high cheek-bones, a forehead ſomewhat elevated, a ſhort, broad, flat noſe, thick lips, ſmall ears, uglineſs, and irregularity of ſhape, characterize their external appearance. The negro women have the loins greatly depreſſed, and very large buttocks, which gives the back the ſhape of a ſaddle. Vices the moſt notorious ſeem to be the portion of this unhappy race: idleneſs, treachery, revenge, cruelty, impudence, ſtealing, lying, profanity, debauchery, naſtineſs, and intemperance, are ſaid to have extinguiſhed the principles of natural law, and to have ſilenced the reproofs of conſcience. They are ſtrangers to every ſentiment of compaſſion, and are an awful example of the corruption of man when left to himſelf.

The origin of the negroes, and the cauſe of their remarkable difference from the reſt of the human ſpecies, has much perplexed the naturaliſts. Mr Boyle has obſerved, that it cannot be produced by the heat of the climate: for though the heat of the ſun may darken the colour of the ſkin, yet experience does not ſhow that it is ſufficient to produce a new blackneſs like that of the negroes.

In Africa itſelf, many nations of Ethiopia are not black; nor were there any blacks originally in the Weſt Indies. In many parts of Aſia, under the ſame parallel with the African region inhabited by the blacks, the people are but tawny. He adds, that there are negroes in Africa beyond the Southern tropic; and that a river ſometimes parts nations, one of which is black and the other only tawny. Dr Barriere alleges, that the gall of Negroes is black, and being mixed with their blood is depoſited between the ſkin and ſcarf-ſkin. However, Dr Mitchel of Virginia, in the Philoſophical Tranſactions, n° 476, has endeavoured by many learned arguments to prove, that the influence of the ſun in hot countries, and the manner of life of their inhabitants, are the remote cauſes of the colour of the Negroes, Indians, &c. Lord Kaimes, on the other hand, and ſuch philoſophers as he, whoſe genius and imagination are too lively to ſubmit to a dry and painful inveſtigation of facts, have contended, that no phyſical cauſe is ſufficient to change the colour, and what we call the regular features of white men, to the dark hue and deformity of the woolly-headed negro. Their arguments have been examined with much acuteneſs and ingenuity by Dr Stanhope Smith of New Jerſey, Dr Hunter, and profeſſor Zimmerman, who have made it in a high degree probable, that the action of the ſun is the original and chief cauſe of the black colour, as well as diſtorted features, of the negro. See AMERICA, n° 48—51. and COMPLEXION.

True negroes are found in no quarter of the globe where the heat of the climate is not very great. They exiſt no where but in the Torrid zone, and only in three regions ſituated in that zone, to wit, in Senegal, in Guinea, and on the weſtern ſhores of Africa, in Nubia, and the Papous land, or what is called *New Guinea*. In all theſe regions the atmoſphere is ſcorching, and the heat exceſſive. The inhabitants of the north are whiteſt; and as we advance ſouthwards towards the line, and thoſe countries on which the ſun's rays fall more perpendicularly, the complexion gradually aſſumes a darker ſhade. And the ſame men, whoſe colour has been rendered black by the powerful action of the ſun, if they remove to the north, gradually become whiter (at leaſt their poſterity), and loſe their burnt colour. Whites, when tranſported into the burning regions of the Torrid zone, are at firſt ſubject to fever; the ſkin of the face, hands, and feet, becomes burnt, hardens, and falls off in ſcales. Hitherto the colour of negroes appears to be only local, extrinſic, and accidental, and their ſhort frizzled and ſparſe hair is to be accounted for in the very ſame manner.

Climate poſſeſſes great and evident influence on the hair, not only of men, but of all other animals. If in one caſe theſe tranſmutations are acknowledged to be conſiſtent with identity of kind, they ought not in the other to be eſteemed criterions of different ſpecies. Nature has adapted the pliancy of her work to the ſituations in which ſhe may require it to be placed. The beaver and ſheep removed to the warm latitudes exchange, the one its fur, and the other its wool, for a coarſe hair that preſerves the animal in a more moderate temperature. The coarſe and black ſhag of the bear is converted, in the arctic regions, into the fineſt and whiteſt fur. The colour of the hair is likewiſe changed by climate. The bear is white under the arctic circle; and, in high northern latitudes, foxes, hares, and rabbits, are found white. Similar effects of climate are diſcernible on mankind. The hair of the Danes is generally red; of the Engliſh, fair or brown; and of the French, commonly black. The hair of all people of colour is black, and that of the African negroes is likewiſe ſparſe and curled in a manner peculiar to themſelves; but this peculiarity is analogous to the effect which a warm climate has on almoſt every other animal. Cold, by obſtructing the perſpiration, tends to throw out the perſpirable matter accumulated at the ſkin in an additional coat of hair. A warm climate, by opening the pores, evaporates this matter before it can be concreted into the ſubſtance of hair; and the laxneſs and aperture of the pores render the hair liable to be eaſily eradicated by innumerable incidents. Its curl may reſult in part from the nature of the ſecretion by which it is nouriſhed, and in part from external heat. That it depends in ſome degree on the quality of the ſecretion is rendered highly probable from its appearance on the chin and other parts of the human body. Climate is as much diſtinguiſhed by the nature and proportion of the ſecretions as by the degree of heat: (See PHYSIOLOGY, ſect. 6.) Whatever be the nutriment of the hair, it is evidently combined in the torrid zone of Africa with ſome fluid of a highly volatile or ardent quality which produces the rank ſmell of many African nations. Saline ſecretions tend to curl and to burn the hair. The evaporation of any volatile ſpirits would render its ſurface dry and diſpoſed to contract; whilſt the centre continuing diſtended by the vital motion, theſe oppoſite dilatations and contractions would neceſſarily produce a curve, and make the hair grow involved. External and violent heat parching the extremities of the hair, tends likewiſe to involve it. A hair held near the fire inſtantly coils itſelf up. Africa is the hotteſt country on the globe; and the influence of its heat, either external or internal, or both, in giving the peculiar form to the hair of the natives, appears, not only from its ſparſeneſs and its curl, but from its colour. It is not of a ſhining, but of an aduſt black; and its extremities tend to brown, as if it had been ſcorched by the fire.

The peculiaries of the negro-features and form may likewiſe be accounted for from the exceſſive heat of the climate and the ſtate of African ſociety. Being ſavages, they have no arts to protect them from the rays of a burning ſun. The heat and ſerenity of the ſky preſerving the lives of the children without much care of the parents they ſeem of courſe to be, in the interior parts of the country, negligent of their offspring. Able themſelves to endure the extremes of that ardent climate, they inure their children to it from their moſt tender age. They ſuffer them to roll in the duſt and ſand beneath the direct rays of a vertical ſun. The mother, if ſhe be engaged, lays down the infant on the firſt ſpot ſhe finds, and is ſeldom at the pains to ſeek the meagre ſhelter of a barren ſhrub, which is all that the interior country affords. When we reflect on the influence of a glare of light upon the eye, and on the contortions of countenance produced by our efforts to repel or prevent it, we need not wonder that the pliant features of a negro-infant ſhould, by conſtant expoſure, acquire that permanent irregularity which we term their characteriſtic uglineſs. But beſides the climate, food and clothing and modes of life have prodigious effects on the human form and features. This is apparent even in poliſhed ſocieties, where the poor and labouring part of the community are much more coarſe in their features, and ill-formed in their limbs, than perſons of better fortune and more liberal means of ſubſiſtence. What an immenſe difference exiſts in Scotland, for inſtance, between the chiefs and the commonalty of the Highland clans? If they had been ſeparately found in different countries, they would have been ranged by ſome philoſophers under different ſpecies. A ſimilar diſtinction takes place between the nobility and peaſantry of France, of Spain, of Italy, and of Germany.

That food and clothing, and the different modes of life, have as great an influence upon the ſhapes and features of the Africans as upon the natives of Europe, is evident from the different appearances of the negroes in the ſouthern republics of America according to the ſtations in which they are employed. "The field ſlaves (ſays Dr Smith) are badly fed, clothed, and lodged. They live in ſmall huts on the plantations, where they labour, remote from the ſociety and example of their ſuperiors. Living by themſelves, they retain many of the cuſtoms and manners of their African anceſtors. The domeſtic ſervants, on the other hand, who are kept near the perſons, or employed in the families of their maſters, are treated with great lenity; their ſervice is light; they are fed and clothed like their ſuperiors; they ſee their manners, adopt their habits, and inſenſibly receive the ſame ideas of elegance and beauty. The field ſlaves are, in conſequence, ſlow in changing the aſpect and figure of Africa. The domeſtic ſervants have advanced far before them in acquiring the agreeable and regular features, and the expreſſive countenance of civil ſociety. The former are frequently ill-ſhaped. They preſerve, in a great degree, the African lips, noſe, and hair. Their genius is dull, and their countenance ſleepy and ſtupid. The latter are ſtraight and well proportioned; their hair extended to three, four, and ſometimes even to ſix or eight inches; the ſize and ſhape of the mouth handſome, their features regular, their capacity good, and their look animated."

Upon the whole, we hope that the reader, who ſhall candidly weigh in his own mind what we have ſaid at preſent and under the article COMPLEXION, will agree with us, that the black colour in the torrid zone, the ſparſe criſp hair of the negroes, and the peculiarities of their features and form, proceed from cauſes altogether extrinſic; that they depend on local temperature and the ſtate of ſociety; and that they are as accidental as the various ſhades of colour which characterize the different nations of Europe. If the whites be conſidered as the ſtock whence all others have ſprung, it is eaſy to conceive how they have degenerated into negroes. Some have conjectured that the complete change may have taken place at the end of three centuries, whilſt others have thought that it could not be effected in leſs than double that period. Such conjectures can be formed from no certain data; and a much greater length of time is undoubtedly neceſſary before negroes, when tranſplanted into our temperate countries, can entirely loſe their black colour. By croſſing the breed with whites, every taint of the negro-colour may be expelled, we believe, from the fifth generation (A).

But the moſt ſerious charge brought againſt the poor negroes is, that of the vices ſaid to be natural to them. If they be indeed ſuch as their enemies repreſent them, treacherous, cruel, revengeful, and intemperate, by a neceſſity of *nature*, they muſt be a different race from the whites; for though all theſe vices abound in Europe, it is evident that they proceed not from nature, but from wrong education, which gives to the youthful mind ſuch deep impreſſions as no future exertion can completely eradicate. Let us inquire coolly if the vices of the negroes may not have a ſimilar origin.

In every part of Africa with which the nations of Europe have any commerce, ſlavery prevails of the worſt kind. Three-fourths of the people are ſlaves to the reſt, and the children are born to no other inheritance. "Moſt parts of the coaſt differ in their governments; ſome are abſolute monarchies, while others draw near to an ariſtocracy. In both the authority of the chief or chiefs is unlimited, extending to life, and it is exerciſed as often as criminal caſes require, unleſs death is commuted into ſlavery; in which caſe the offender is ſold, and if the ſhipping will not buy the criminal, he is immediately put to death. Fathers of free condition have power to ſell their children, but this power is very ſeldom enforced." In Congo, however, a father * will ſell a ſon or daughter, or perhaps both, for a piece of cloth, a collar or girdle of coral or beads, and often for a bottle of wine or brandy. A huſband may have as many wives as he pleaſes, and repudiate or even ſell them, though with child, at his pleaſure. The wives and concubines, though it be a capital crime for the former to break the conjugal faith, have a way to rid themſelves of their huſbands, if they have ſet their affections upon a new gallant, by accuſing them of ſome crime for which the puniſhment is death. In a word, the bulk of the people in every ſtate of Africa are born ſlaves to great men, reared as ſuch, held as property, and as property ſold (see SLAVERY). There are indeed many circumſtances by which a free man may become a ſlave: ſuch as being in debt, and not being able to pay; and in ſome of ſuch caſes, if the debt be large, not only the debtor, but his family likewiſe, become the ſlaves of his creditor, and may be ſold. Adultery is commonly puniſhed in the ſame manner, both the offending parties being ſold, and the purchaſe money paid to the injured huſband. *Obi*, or pretended witchcraft (in which all the negroes firmly believe, ſee WITCHCRAFT), is another, and a very common offence, for which ſlavery is adjudged the lawful puniſhment; and it extends to all the family of the offender. There are various other crimes which ſubject the offender and his children to be ſold; and it is more than probable, that if there were no buyers, the poor wretches would be murdered without mercy.

Edwards's History of the Weſt Indies, vol ii.

* Mod. Univ. Hiſtory. vol. xvi. p. 55.

In ſuch a ſtate of ſociety what diſpoſitions can be looked for in the people, but cruelty, treachery, and revenge? Even in the civilized nations of Europe, bleſſed with the lights of law, ſcience, and religion, ſome of the lower orders of the community conſider it as a very trivial crime to defraud their ſuperiors; whilſt almoſt all look up to them with ſtupid malevolence or rancorous envy. That a depreſſed people, when they get power into their hands, are revengeful and cruel, the preſent age affords a dreadful proof; and is it wonderful that the negroes of Africa, unacquainted with moral principles, blinded by the crueleſt and moſt abſurd ſuperſtitions, and whoſe cuſtoms tend to eradicate from the mind all natural affection, ſhould ſometimes diſplay to their lordly maſters of European extraction the ſame ſpirit that has been ſo generally diſplayed by the lower orders of Frenchmen to their eccleſiaſtics, their nobles, and the family of their murdered ſovereign! When we conſider that the majority of the negroes groan under the cruelleſt ſlavery, both in their own country and in every other where they are to be found in conſiderable numbers, it can excite no ſurpriſe that they are in general treacherous, cruel, and vindictive. Such are the caprices of their tyrants at home, that they could not preſerve their own lives or the lives of their families for any length of time, but by a perpetual vigilance, which muſt neceſſarily degenerate, firſt into cunning, and afterwards into treachery; and it is not conceivable that habits formed in Africa ſhould be inſtantly thrown off in the Weſt Indies, where they are the property of men whom ſome of them muſt conſider as a different race of beings.

But

(A) 1. A white man with a negro woman, or a negro man with a white woman, produce a mulatto, half white and half black, or of a yellow-blackiſh colour, with black, ſhort, frizzled hair. 2. A white man with a mulatto woman, or a negro with a mulatto woman, produce a *quadroon*, three fourths white and one fourth black, or three fourths black and one fourth white, or of a lighter yellow than the former. The name of *cabres* is given to thoſe who are deſcended from a black man and a mulatto woman, or a mulatto man and a black woman, who are three fourths black and one fourth white, and who are not ſo black as a negro, but blacker than a mulatto. 3. A white man with a quadroon woman, or a negro with a quadroon woman, produce a *meſtizo*, ſeven eighths white and one eighth black, or ſeven eighths black and one eighth white. 4. A white man with a meſtizo woman, or a negro with a meſtizo woman, produce, the one almoſt a perfect white, the other almoſt a perfect black, called a *quinteroon*. This is the laſt gradation, there being no viſible difference between the fair quinteroons and the whites; and the children of a white and quinteroon conſider themſelves as free from all taint of the negro race.

But the truth is, that the ill qualities of the negroes have been greatly exaggerated. Mr Edwards, in his valuable Hiſtory of the Weſt Indies, aſſures us that the Mandingo negroes diſplay ſuch gentleneſs of diſpoſition and demeanour, as would ſeem the reſult of early education and diſcipline, were it not that, generally ſpeaking, they are more prone to theft than any of the African tribes. It has been ſuppoſed that this propenſity, among other vices, is natural to a ſtate of ſlavery, which degrades and corrupts the human mind in a deplorable manner; but why the Mandingoes ſhould have become more vicious in this reſpect than the reſt of the natives of Africa in the ſame condition of life, is a queſtion he cannot anſwer.

"The circumſtances which (according to the ſame author) diſtinguiſh the Koromantyn or Gold Coaſt negroes from all others, are firmneſs both of body and mind; a ferociouſneſs of diſpoſition; but withal, activity, courage, and a ſtubbornneſs, or what an ancient Roman would have deemed an elevation of ſoul, which prompts them to enterpriſes of difficulty and danger, and enables them to meet death, in its moſt horrible ſhape, with fortitude or indifference. They ſometimes take to labour with great promptitude and alacrity, and have conſtitutions well adapted for it; for many of them have undoubtedly been ſlaves in Africa. But as the Gold Coaſt is inhabited by various tribes, which are engaged in perpetual warfare and hoſtility with each other, there cannot be a doubt that many of the captives taken in battle, and ſold in the European ſettlements, were of free condition in their native country, and perhaps the owners of ſlaves themſelves. It is not wonderful that ſuch men ſhould endeavour, even by means the moſt deſperate, to regain the freedom of which they have been deprived; nor do I conceive that any further circumſtances are neceſſary to prompt them to action, than that of being ſold into captivity in a diſtant country. One cannot ſurely but lament (ſays our author), that a people thus naturally intrepid, ſhould be ſunk into ſo deplorable a ſtate of barbarity and ſuperſtition; and that their ſpirits ſhould ever be broken down by the yoke of ſlavery! Whatever may be alleged concerning their ferociouſneſs and implacability in their preſent notions of right and wrong, I am perſuaded that they poſſeſs qualities which are capable of, and well deſerve, cultivation and improvement.

"Very different from the Koromantyns are the negroes imported from the Bight of Benin, and known in the Weſt Indies by the name of Eboes. So great is their conſtitutional timidity and deſpondency of mind as to occaſion them very frequently to ſeek, in a voluntary death, a refuge from their own melancholy reflections. They require therefore the gentleſt and mildeſt treatment to reconcile them to their ſituation; but if their confidence be once obtained, they manifeſt as great fidelity, affection, and gratitude, as can reaſonably be expected from men in a ſtate of ſlavery. The females of this nation are better labourers than the men, probably from having been more hardly treated in Africa.

"The natives of Whidah, who, in the Weſt Indies, are generally called *Papaws*, are unqueſtionably the moſt docile and beſt-diſpoſed ſlaves that are imported from any part of Africa. Without the fierce and ſavage manners of the Koromantyn negroes, they are alſo happily exempt from the timid and deſponding temper of the Eboes. The cheerful acquieſcence with which theſe people apply to the labours of the field, and their conſtitutional aptitude for ſuch employment, ariſe, without doubt, from the great attention paid to agriculture in their native country. Boſman ſpeaks with rapture of the improved ſtate of the ſoil, the number of villages, and the induſtry, riches, and obliging manners of the natives. He obſerves, however, that they are much greater thieves than thoſe of the Gold Coaſt, and very unlike them in another reſpect, namely, in the dread of pain, and the apprehenſion of death. They are, ſays he, ſo very apprehenſive of death, that they are unwilling to hear it mentioned, for fear *that* alone ſhould haſten their end; and no man dares to ſpeak of death in the preſence of the king, or any great man, under the penalty of ſuffering it himſelf, as a puniſhment for his preſumption. He relates further, that they are addicted to gaming beyond any people of Africa. All theſe propenſities are obſervable in the character of the Papaws in a ſtate of ſlavery in the Weſt Indies. That puniſhment which excites the Koromantyn to rebel, and drives the Ebo negro to ſuicide, is received by the Papaws as the chaſtiſement of legal authority, to which it is their duty to ſubmit patiently. The caſe ſeems to be, that the generality of theſe people are in a ſtate of abſolute ſlavery in Africa, and, having been habituated to a life of labour, they ſubmit to a change of ſituation with little reluctance."

Having recited ſuch obſervations as occurred to him on contemplating the various tribes of negroes from each other, Mr Edwards thus eſtimates their general character, influenced as they are by circumſtances which ſoon efface the native and original impreſſions which diſtinguiſh one nation from another when newly imported into the Weſt Indies.

"Notwithſtanding what has been related of the firmneſs and courage of the natives of the Gold Coaſt, it is certain that the negroes in general in our iſlands (ſuch of them at leaſt as have been any length of time in a ſtate of ſervitude) are of a diſtruſtful and cowardly diſpoſition. So degrading is the nature of ſlavery, that fortitude of mind is loſt as free agency is reſtrained. To the ſame cauſe probably muſt be imputed their propenſity to conceal or violate the truth; which is ſo general, that the vice of falſehood is one of the moſt prominent features in their character. If a negro is aſked even an indifferent queſtion by his maſter, he ſeldom gives an immediate reply; but, affecting not to underſtand what is ſaid, compels a repetition of the queſtion, that he may have time to conſider, not what is the true anſwer, but what is the moſt politic one for him to give. The proneneſs obſervable in many of them to the vice of theft has already been noticed; and I am afraid (ſays our author), that evil communication makes it almoſt general. It is no eaſy matter, I confeſs, to diſcriminate thoſe circumſtances which are the reſult of proximate cauſes, from thoſe which are the effects of national cuſtoms and early habits in ſavage life; but I am afraid that cowardice and diſſimulation have been the properties of ſlavery in all ages, and will continue to be ſo to the end of the world. It is a ſituation that neceſſarily ſuppreſſes many of the beſt affections of the human heart.—If it calls forth any latent virtues, they are thoſe of ſympathy and compaſſion towards perſons in the ſame condition of life; and accordingly we find that the negroes in general are ſtrongly attached to their countrymen, but above all, to ſuch of their companions as came in the ſame ſhip with them from Africa. This is a ſtriking circumſtance: the term *ſhipmate* is underſtood among them as ſignifying a relationſhip of the moſt endearing nature; perhaps as recalling the time when the ſufferers were cut off together from their common country and kindred, and awakening reciprocal ſympathy from the remembrance of mutual affliction. But their benevolence, with a very few exceptions, extends no further. The ſofter virtues are ſeldom found in the boſom of the enſlaved African. Give him ſufficient authority and he becomes the moſt remorſeleſs of tyrants. Of all the degrees of wretchedneſs endured by the ſons of men, the greateſt, aſſuredly, is the miſery which is felt by thoſe who are unhappily doomed to be the ſlaves of ſlaves; a moſt unnatural relation, which ſometimes takes place in the ſugar plantations. The ſame obſervation may be made concerning their conduct towards the animal creation. Their treatment of cattle under their direction is brutal beyond belief. Even the uſeful and ſocial qualities of the dog ſecure to him no kind uſage from an African maſter. One of the moſt pleaſing traits in their character is the reſpect and attention which they pay to their aged countrymen. The whole body of negroes on a plantation muſt be reduced to a deplorable ſtate of wretchedneſs, if, at any time, they ſuffer their aged companions to want the common neceſſaries of life, or even many of its comforts, as far as they can procure them. They ſeem to be actuated on theſe occaſions by a kind of involuntary impulſe, operating as a primitive law of nature, which ſcorns to wait the cold dictates of reaſon: among them, it is the exerciſe of a common duty, which courts no obſervation, and looks for no applauſe."

As the colour, and features, and moral qualities of the negroes may be thus eaſily accounted for by the influence of climate and the modes of ſavage life, ſo there is good reaſon to believe that their intellectual endowments are equal to thoſe of the whites who have been found in the ſame circumſtances. Of thoſe imitative arts in which perfection can be attained only in an improved ſtate of ſociety, it is natural to ſuppoſe that they have but little knowledge; but the fabric and colours of the Guinea cloths are a proof of their native ingenuity. In the Weſt Indies many of them are expert carpenters, ſome watchmakers, and one or two have ſucceſsfully practiſed phyſic; whilſt others have figured both in Latin and in Engliſh poetry, ſo that we cannot doubt but that "God who made the world, hath made of one blood all nations of men," and animated them with minds equally rational.

NEGROLAND, or Nigritia, a country of Africa, lying next to Guinea towards the north, and extending from 18° of weſt to 23° of eaſt longitude, and from 9° to 20° of north latitude. On the north it is bounded by Zara or the Deſert; on the eaſt, by countries unknown; on the ſouth, by Guinea; and on the weſt, by the Atlantic Ocean; and is watered by the great river Niger or Senegal, which runs through it from eaſt to weſt. The Europeans have ſettlements on the coaſts of this country, eſpecially near the mouths of the Niger and Gambia, which laſt is ſuppoſed to be a branch of the former. A great many nations inhabit the banks of the rivers; ſome Pagans, ſome Mohammedans, of different languages, and independent of one another. The country is fruitful, eſpecially along the rivers; abounding in rice, Guinea grain, and Indian corn, where it is cultivated; and with cocoa-nuts, plantains, pulſe, palm-trees, and tropical fruits; nor is it deſtitute of cattle, and a variety of other animals, particularly ſuch as abound in Guinea. See Guinea.

Negroland is fertilized by the overflowing of its rivers the Senegal and Gambia, as Egypt is by the Nile. It hath not yet been aſcertained whether the Gambia is a branch of the Senegal or not. As far as the Europeans have penetrated up the country, they appear to be diſtinct; and the Mandingo Negroes report that the Gambia has a different origin. The entrance into the Niger or Senegal river is narrow and ſomewhat difficult, by reaſon of its immoveable bar and ſandy ſhoals, as well as the ſeveral iſlands at the mouth of it, and the ſeveral canals and marſhes that clog it: but after ſailing up eight or ten leagues, it is found broad and deep, and fit to carry large veſſels; and, excepting about five or ſix leagues on each ſide above the mouth, which is ſandy and barren ground, the banks are covered with ſtately trees and villages, and the country in general is fertile and well watered; for, like the Nile, this river overflows its banks for many leagues, and enriches the land to a great degree, though, for want of ſkill, the inhabitants do not reap the advantages which they might obtain from its fertility. The people on both ſides of the river live as near to it as they can, and feed great herds of cattle, ſowing large and ſmall millet, the former of which is called by us *Turkey wheat*, in great quantities, and with great increaſe. If the river fails of overflowing at its uſual ſeaſon, a great ſcarcity enſues in the adjacent country; and, even when it overflows regularly, it breeds ſuch vaſt flights of graſshoppers and inſects, as quite darken the air, and frequently devour all the product of the earth: in which caſe the people take thoſe inſects and eat them; which they do either by pounding in leathern bags, and then boiling them in milk, or, which is reckoned the more delicious method, by frying or broiling them over a light blaze in a frying-pan full of holes. Thus the legs and wings of the inſects are burnt off, and the reſt of the body is ſufficiently roaſted to be eaten as a dainty, which they look upon to be very wholeſome and nouriſhing.

To the eaſt, north-eaſt, and ſouth-eaſt of the iſland of Senegal, the country, as far as it is known, is over-run with woods and marſhes; the Senegal, Gambia, and Sherbro, which are looked upon by ſome as branches of one immenſe river, paſſing through it in their way to the Atlantic Ocean. During the rainy months, which begin in July, and continue to October, they lay the whole country under water; and indeed the ſudden riſe of theſe rivers is incredible to ſuch as are not acquainted with the violent rains that fall between the tropics. At Galam, 900 miles from the mouth of the Senegal, the waters riſe 150 feet perpendicular from the bed of the river. At the iſland of Senegal, the river riſes gradually, during the rainy ſeaſon, Negropont.

ſeaſon, above 20 feet perpendicular over part of that flat coaſt; which of itſelf ſo freſhens the water, that ſhips lying at anchor, at the diſtance of three leagues from its mouth, generally make uſe of it, and fill their water there for their voyage home. When the rains are at an end, which ſoon happens in October, the intenſe heat of the ſun uſually dries up thoſe ſtagnating waters which lie on the higher parts, and the remainder form lakes and marſhes, in which are found all ſorts of dead animals. At laſt, thoſe too are quite dried up; and then the effluvia that ariſe are almoſt quite inſupportable. At this ſeaſon the winds blow ſo hot from the land, that they may be compared to the heat proceeding from the mouth of an oven, and they bring with them an intolerable ſmell. The wolves, tigers, lions, and other wild beaſts, then reſort to the river, ſteeping their body under water, and only their ſnout above it for the ſake of breathing. The birds ſoar to an immenſe height in the air, and fly a vaſt way over the ſea, where they continue till the wind changes, and comes from the weſt.

Negroes White. See Heliophobi and Albino.

NEGROMANCY. See Necromancy.

NEGROPONT, anciently *Eubœa*, an iſland of the Archipelago, ſtretching along the eaſtern coaſt of Achaia or Livadia, from which it is ſeparated by a narrow channel called the *Euripus*. This ſtrait is ſo narrow, that the iſland is joined to the continent by a bridge thrown over it; and here, it is thought, there was formerly an iſthmus. The irregularity of the tides in the Euripus hath from the remoteſt antiquity been very remarkable, and this irregularity is found to be connected with the age of the moon. From the three laſt days of the old moon to the eighth day of the new moon, and from the 14th to the 20th day incluſive, they are regular; but on the other days they are irregular, flowing 12, 13, or 14 times in the ſpace of 24 hours, and ebbing as often. The iſland is 90 miles long and 25 broad in the wideſt part; and produces corn, oil, fruit, and cattle, in great abundance. The only place in the iſland worth notice is the capital, which is alſo called *Negropont;* and which is walled, and contains about 15,000 inhabitants; but the Chriſtians are ſaid to be much more numerous than the Turks. The captain Baſhaw, or admiral of Turkey, who is alſo governor of the city, the iſland, and the adjacent continent of Greece, reſides here; and the harbour, which is very ſafe and ſpacious, is ſeldom without a fleet of galleys, ready to be put to ſea againſt the pirates and the Malteſe. A part of the bridge between the city and the coaſt of Greece, conſiſts of a drawbidge no longer than juſt to let a galley paſs through.

Negropont.

END OF THE TWELFTH VOLUME.

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